

VIDEO-BASED INTERVENTION FOR INDIVIDUALS WITH AUTISM

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Statement of Ethical Conduct

The research associated with this thesis abides by the international and Australian codes on human and animal experimentation, the guidelines of the Human Research Ethics Committee (Tasmania), the guidelines by the Australian Government's Office of the Gene Technology Regulator and the rulings of the Safety, Ethics and Institutional Biosafety Committees of the University. (See also Appendix A and Appendix B for approval of the project.)

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Abstract

This doctoral research investigated video-based intervention (VBI) for individuals with autism. Without effective intervention, individuals with autism are likely to experience difficulties with functioning at home, progressing at school, and becoming independent in the community. VBI is a promising educational approach for this population. However, this thesis highlights several important practical and theoretical questions relating to VBI for individuals with autism that have, to date, remained unanswered. In particular, this doctoral research focuses on whether there is a positive relationship between a participant's imitation ability and the effectiveness of VBI. It also explores the question of whether one type of model (an adult, a peer, a sibling, or the participant themselves) is more effective than the others. Five boys diagnosed with autism and aged between nine and 15 years participated in the three intervention studies. Each study utilised a single-case research design.

In the first study, the participant's imitation assessment (interview and observation-based formats) suggested that he was suited to VBI. As a result of the video modelling (VM) procedures (with an adult-as-model), the participant's completion of two daily living tasks improved. In the second study, no improvements were observed across three target behaviours as a result of either the adult-as-model or the sibling-as-model VBI conditions. The findings of the second study could be explained, at least in part, by limitations in the participant's imitation skills, as evidenced by his imitation

assessment scores. In the third study, no differences in the effectiveness of the adult-as-model compared with the peer or sibling-as-model conditions were evident for teaching the three boys to tie a shoelace knot. Also, a backward chaining procedure was found to be more effective than the video prompting procedures. Imitation assessment scores, as well as adaptive behaviour age equivalents and severity of autistic impairment scores, could be used to explain differences in acquisition of the target behaviour across participants in the third study.

Overall, the findings are consistent with the hypothesis that participants who demonstrate stronger imitation skills are more likely to benefit from VBI. No consistent differences between the effectiveness of sibling, peer, or adult models were identified. The findings of the three studies are considered in terms of how these and other variables influence the effectiveness of VBI. The contribution of these findings to the field and their implications for both research and practice are discussed.

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Frequently Used Acronyms

ABA	Applied behaviour analysis
ASD	Autism spectrum disorder
CARS	<i>Childhood Autism Rating Scale</i>
IDE	<i>Imitation Disorders Evaluation</i>
IEP	Individual Education Plan
IOA	Inter-observer agreement
LM	Live modelling
VABS	<i>Vineland Adaptive Behaviour Scales</i>
VBI	Video-based intervention
VM	Video modelling
VP	Video prompting
VSM	Video self-modelling

Chapter 1 - Introduction

The overarching aim of this thesis is to investigate and refine video-based interventions (VBI) as a means to improve the quality of life for individuals with autism. The studies described here were designed to benefit the participants directly through tailored educational interventions, as well as benefit the academic community and broader population through contributing new perspectives and knowledge regarding these procedures. This chapter provides the context from which the specific research aims arise.

1.1 The definition of autism

Autism spectrum disorder (ASD) is a broad term including autism (or 'Autistic Disorder'), Aspergers Syndrome, Retts Syndrome, Childhood Disintegrative Disorder, and Pervasive Developmental Disorders Not Otherwise Specified (PDD-NOS) (American Psychiatric Association, 2000; Roberts & Prior, 2006). Autism, as a diagnosis, has its conceptual origins in a paper by Kanner (1943). Kanner presented 11 case histories of children and described a set of behaviours comprising what he termed 'inborn autistic disturbances of affective contact' (Kanner, 1943, p. 250). Among the most striking behavioural characteristics shared by these children were their impairments in social interactions. Kanner identified their inability to relate with others and powerfully described the 'autistic aloneness' of the children he observed. Although eight of the

eleven children had acquired speech, the ability of all the children to use language to convey meaning, rather than just repetition of memorised statements or echolalia, was impaired. Kanner also described the monotonously repetitious nature of the children's behaviour and their anxiously obsessive desire for the maintenance of sameness.

As well as observing the behavioural impairments that were apparent in the children, Kanner suggested that the children shared relative strengths in rote memory and related cognitive abilities. Based on the case histories of these children, particularly their early years, Kanner concluded that this condition was biologically determined, rather than being a result of interactions with their environment after birth. According to Sigafos, Green, Edrisinha, and Lancioni (2007a), Kanner's claims were not universally accepted in the 1940s, 1950s and 1960s following the publication of his case studies. For example, through a case study presented by Bettelheim (1959), it was suggested that the parents' treatment of their child influenced (if not determined) their presentation of autistic behaviours - a suggestion which was in contrast to Kanner's hypothesis of a biological (genetic) cause.

Kanner's (1943) paper has remained as a seminal work in relation to studies of what has been referred to as 'Kanner's Syndrome' and more recently referred to as 'Autistic Disorder' or 'autism' (American Psychiatric Association, 2000; Prior & MacMillan, 1973). A comparative reading of Kanner's (1943) descriptions and the standard for diagnostic criteria for Autistic Disorder as outlined by the American Psychiatric Association (2000) illustrates why this is the case. Kanner (1943) had

suggested that these case histories of 11 children provided examples of a previously unspecified category of disorder. In their 'Diagnostic and statistical manual of mental disorders: DSM-IV-TR', the American Psychiatric Association (2000) described three primary behavioural characteristics which help inform a diagnosis of Autistic Disorder, including: (1) qualitative impairment in social interaction; (2) qualitative impairment in communication; and (3) restricted repetitive and stereotyped patterns of behaviour, interests, and activities. Each of these three characteristics was observed and described with specific detail by Kanner (1943).

According to Bristol et al. (1996), the diagnostic criteria outlined by the American Psychiatric Association (1994) are in concert with those of the World Health Organisation (1992). The biological basis suggested by Kanner (1943) has also been supported by research has described autism as a strongly genetic disorder, with a heritability value of about 90% (Gupta & State, 2007; Shastri, 2005).

1.2 The nature of autism

Without effective intervention, individuals with autism (and their families) can expect a compromised quality of life. Though there is considerable variation in the levels of adaptive function among individuals with autism, people with this developmental disorder have typically been given a poor prognosis in terms of independent living (American Psychiatric Association, 2000; Lovaas, 1987). Individuals with autism may exhibit behavioural symptoms, such as hyperactivity, short attention spans and

impulsivity (American Psychiatric Association, 2000), and frequently experience difficulties in learning and achieving academically at school, compared with their normally developing peers (Dunlap, Koegel, & Egel, 1979; Lovaas, 1987). Spoken language development may be delayed or completely absent, with up to 50% of individuals with autism not developing functional speech (British Columbia Ministry of Education, 2000). For those who do develop functional speech, difficulties with grammar, comprehension, and non-literal language mean that they often struggle to understand simple questions or directions (American Psychiatric Association, 2000; Maione & Mirenda, 2006). Due to gross and sustained impairments in reciprocal social interactions and an impaired ability to understand the emotions of others and themselves, individuals with autism frequently have difficulty with peer and other relationships (Bristol et al., 1996; Nikopoulos & Keenan, 2003).

The insistence on sameness and low level of behavioural flexibility that typifies individuals with autism can be particularly problematic (Green et al., 2007; Lewis & Bodfish, 1998; Wahlberg & Jordan, 2001). For some children with autism, tantrums associated with self-injurious behaviour can result from seemingly small changes in their environment or routine (Schreibman, Whalen, & Stahmer, 2000). Furthermore, people with autism are often mildly to severely intellectually disabled, and have difficulties in performing daily living and self-care skills (Cannella et al., 2006; Shipley-Benamou, Lutzker, & Taubman, 2002; Sigafos et al., 2005).

1.3 The prevalence of autism

The prevalence of people being diagnosed with autism is increasing. The American Psychiatric Association (2000) reported median rates of five diagnoses per 10,000 with males having diagnosis rates of up to five times higher than females, and approximately 5% of siblings of individuals with the disorder have also been diagnosed. Other research conducted since this time suggested that there has been an increase in the prevalence of individuals being diagnosed with this developmental disorder. Wing and Potter (2002) reported prevalence rates of up to 60 per 10,000 individuals for autism and higher for all the autism spectrum disorders (ASD) for some cohorts. According to MacDermott, Williams, Ridley, Glasson, and Wray (2007), the prevalence rate of 62.5 per 10,000 individuals represented about 125,000 people in Australia. Research published in 2004 recorded that the prevalence of children identified with autism had increased ten-fold over a period of 16 years in the Barwon region of Victoria (Icasiano, Hewson, Machet, Cooper, & Marshall, 2004). These findings are consistent with figures from other research conducted in the USA and the UK (Williams, Mellis, & Peat, 2005; Yeargin-Allsopp et al., 2003).

Although there is some consensus regarding the increase in prevalence of autism, researchers do not know what is causing this increase. Also, it is not clear to what extent a greater awareness and availability of services are influencing rates of diagnosis relative to actual increases in the disorder (American Psychiatric Association, 2000; Bristol et al., 1996; Metz, Mulick, & Butter, 2005; Wing & Potter, 2002). According

to Fombonne (2009) much of the increase in prevalence estimates can be accounted for by changes in definitions, criteria and methods of identifying individuals with ASD used over time and across geographical boundaries. While Fombonne suggested that an actual increase in the incidence of ASD has not been satisfactorily demonstrated by research, this possibility cannot currently be ruled out. Whether or not there has been an increase in actual incidence, the increase in prevalence of autism, both internationally and in Australia, means that more families and individuals are seeking relevant support services in response to a diagnosis of autism.

1.4 The need for evidence-based approaches to intervention

The difficulties that autistic symptoms can present to the individual and to others as well as the prevalence of the disorder have encouraged a number of different approaches to intervention (Green et al., 2006a; Jacobson, Foxx, & Mulick, 2005b; Metz et al., 2005; Sigafoos et al., 2007a). Because autism is believed to be due to atypical development in the early embryonic stages of an individual's life, pharmacological interventions cannot 'cure' autism (Metz et al., 2005; Rapin, 2002). Medication can assist with reducing aggressive, self-injurious, inattention-related and stereotypic behaviours to maximise the opportunity for implementing intensive educational intervention (Bristol et al., 1996; Metz et al., 2005; Rapin, 2002; Roberts & Prior, 2006; Volkmar, 2001).

In an internet survey of parents whose children have been diagnosed with autism, Green et al. (2006a) reported that 108 different interventions were in use. The

average number of different types of interventions in use for each child at one time was seven. Perhaps more alarming was the finding that for the population who completed the survey on the whole, the level of empirical support (or lack thereof) for a given intervention was not correlated with the frequency at which the intervention type was used. That is, interventions that had a strong evidence-base were not necessarily used more often than interventions that did not have a strong evidence-base or have been shown (by research) to be ineffective or even detrimental. Thus, there is a need for researchers to identify and promote evidence-based practices to inform intervention programs for individuals with autism (Green et al., 2006a; Jacobson, Foxx, & Mulick, 2005a; Sigafoos et al., 2007a; Simpson, 2005). The motivation and rationale for this doctoral research has arisen from this context of increasing need for effective educational interventions for individuals with autism.

1.5 Video-based intervention

Providing effective educational programs for individuals with autism is a complex and challenging task (Lovaas, 1987; Lovaas & Smith, 1989; Metz et al., 2005). One approach to teaching individuals with autism that has been supported by recent research involves the presentation of relevant video-footage (Ayres & Langone, 2005; Bellini & Akullian, 2007; Buggey, 1995b, 2007; Delano, 2007a; McCoy & Hermansen, 2007; Mechling, 2005). Although a number of procedural types of video-based intervention (VBI) have been used effectively for a range of target behaviours, important questions about this approach have still remained unanswered (see *Chapter 2*).

The studies described in this thesis have been designed to find answers to questions related to predicting which individuals with autism are better suited to VBI and to evaluating which type of model (such as an adult, a peer, a sibling or the participant themselves) is more effective as part of VBI procedures. Findings from such research could further improve the use of VBI, making it a more efficient and reliable intervention in the repertoire of evidence-based interventions available to parents, educators and other professionals. These findings may in turn contribute to the participation, independence, and quality of life of individuals with autism and their families.

1.6 Theoretical framework

1.6.1 Modelling, imitation, and observational learning

Before the technology used for VBI was widely available, modelling itself was a well established vehicle for learning. According to Bandura (1986): ‘through the years, modelling has always been acknowledged to be one of the most powerful means of transmitting values, attitudes, and patterns of behaviour’ (p. 47). The terms ‘modelling’, ‘imitation’, and ‘observational learning’ are sometimes used to describe the same phenomena, and at other times they convey different meanings or emphasise a different aspect of this learning process (Bandura, 1986; Darden-Brunson, Green, & Goldstein, 2008; Nikopoulos & Keenan, 2006). Cooper, Heward, and Heron (1987), who described

imitation from a behavioural perspective, suggested that it consists of: (a) the presentation of a model; (b) performance of the imitative behaviour; and (c) the reinforcement of the imitated behaviour. This view of imitation is consistent with the reinforcement theory of observational learning, in that the consequences of the observer's behaviour (rather than the model) are emphasised (Nikopoulos & Keenan, 2006). Studies which have documented how the imitation of the model's behaviour was dependent upon the consequences of the imitative behaviour support this theory (Baer, Peterson, & Sherman, 1967; Baer & Sherman, 1964)

The social cognitive perspective of observational learning emphasises the consequences of the model's behaviour on the observer. This is explained by four sub-processes relating to: (1) attention; (2) retention; (3) motor reproduction; and (4) motivation (Bandura, 1977, 1986; Darden-Brunson et al., 2008; Nikopoulos & Keenan, 2006). Bandura and his colleagues illustrated the power of modelling to influence behaviour and the effectiveness of vicarious reinforcement (Bandura & Huston, 1961; Bandura & Menlove, 1968; Bandura, Ross, & Ross, 1963b). From a social cognitive perspective, the term 'imitation' describes little more than mimicry, and does not account for the broader psychological matching processes involved with 'modelling' (Bandura, 1977). Using currently available technology as the medium to teach adaptive behaviours (such as the digital video camera and laptop computer used in this research) can be viewed as the logical extension of observational learning theory as proposed by

Bandura (Bellini & Akullian, 2007; Darden-Brunson et al., 2008; Nikopoulos & Keenan, 2006).

1.6.2 Application of terms

In this thesis, ‘modelling’ refers to the behaviours of others to which the learner attends. ‘Imitation’ refers to the learner copying modelled behaviours, in the behavioural sense, with the emphasis on what the learner can be observed to do. ‘Observational learning’ refers to the learner processing information regarding the modelled behaviour, understanding the appropriate contexts in which to perform the modelled behaviour, and demonstrating this learning by performing the modelled behaviour accordingly. Therefore, when referring to observational learning, the emphasis is on what learning has taken place by the individual participant as evidenced by relevant behaviours.

In this research on VBI, modelling will be an intervention arranged by the researchers. It is anticipated that imitation will be the way in which participants respond to the intervention. Observational learning by the participants may be inferred by their positive performance of the target behaviours (see Table 1-1).

Table 1-1. A summary of the terms ‘modelling’, ‘imitation’ and ‘observational learning’ as they apply in this thesis.

Term	Definition used	Aspect of this research
Modelling	The performance of behaviours the learner observes	The primary intervention utilised and evaluated
Imitation	Learner’s performance of modelled behaviours	A positive response to the intervention – acquisition of the target behaviour
Observational learning	Learning from modelled behaviours	A parsimonious inference for a positive response to the intervention

1.7 Philosophical framework: Educational opportunities to enhance an individual’s quality of life

Because effective implementation of interventions such as those investigated in this thesis require a suitable context, a brief discussion of the ‘special education’ and ‘inclusion’ paradigms is included here to briefly illustrate the researcher’s perspective. This initial focus of this section is based on a discussion of the work of Dunn (1968) and Mock and Kauffman (2005). Although at a first glance of the titles these papers may seem to represent opposing viewpoints, a deeper analysis could see them as different contributions to the same position regarding the ideal educational provision for students with disabilities such as autism.

In his paper, Dunn (1968) reviewed the empirical efficacy (or lack thereof) regarding special education for those with little more than a cultural disadvantage.

Citing the detrimental effect of homogenous groupings and labelling processes, including biased expectations from educators and reduced self-image of the students, he argued against the segregation of such students from the regular classroom. Dunn suggested that improvements in general education - namely changes in school organisation, curricular changes, changes in professional public school personnel, and hardware changes – were making integration more viable and special education more obsolete for students labelled ‘mildly retarded’.

Nevertheless, it is clear that Dunn (1968) did not argue for ‘full-inclusion’ or for abandoning special education schools for children with severe disabilities. Rather, he sought to expose inequitable arrangements which have been empirically demonstrated to be detrimental to the progress of students whose label has been the basis of their exclusion from the opportunities of a regular classroom. Despite this, Dunn’s paper has been used to justify what Mock and Kauffman (2005) described as the full inclusion movement.

Mock and Kauffman (2005) argued that full inclusion (a paradigm in which all students are educated within the same regular classroom) would be an ineffective, if not harmful approach for the education of some students with significant developmental disabilities and disorders. They suggested that the full inclusion philosophy was based on an unfounded assumption that location in itself will determine the efficacy of an education. They rejected the claim that full inclusion is a social justice priority, noting an illogical comparison made by the full inclusion movement between the racial

segregation of schools of former decades and the provision of specialised centres. Furthermore Mock and Kauffman (2005) argued that the full inclusion movement assumed an oversimplified view of inclusion, with references mainly to the primary stages of schooling, as well as practices that are demonstrated to be less effective for students with more severe disabilities. Mock and Kauffman (2005) suggested that the full inclusion movement was ignorant of scrutiny that shows that it was based on false premises of how students with significant disabilities learn and on studies that were compromised by methodological shortcomings. In short, they argued that the full inclusion movement was an extreme position which was largely ideologically based, rather than based on relevant empirical research evidence. They suggested that equity and fairness can be more effectively offered to students by providing a continuum of alternative placements to meet different individual needs. That is, all students should not only be tolerated, they should be taught.

Thus, Mock and Kauffman (2005) and Dunn (1968) seem to be agreed on the central ideals that students with severe disabilities should have access to educators with relevant skills and fewer other students to be responsible for, as well as choice in the process of programming and intervention selection. Both papers stressed the importance of providing opportunities rather than constraints. While Dunn argued against those from deprived cultural or socioeconomic backgrounds being constrained to special education classes, Mock and Kauffman argued against students with significant

disabilities being constrained within regular classrooms as opposed to having access to a continuum of alternative placements to best suit their individual needs.

Lovaas (1987) drew attention to how the opportunity to have access to individualised programming and the provision of a high staff to student ratio was important in maximising educational outcomes for individuals diagnosed with autism. Lovaas and Smith (1989) proposed a behavioural theory of 'autistic children' which articulated and argued for a paradigm for effective research studies and interventions. The four tenets of their theory were that: (1) the laws of learning account for the behaviour and provide the basis of intervention regarding children with autism; (2) children with autism have many separate behavioural deficits best described as developmental delays (rather than a central deficit to be targeted for general improvement); (3) evidence shows that children with autism are quite capable of learning if they are in the right environment; and (4) children with autism's difficulties are best understood as a mismatch between their atypical nervous system and the typical environments they live in (rather than a disease to be cured).

Lovaas (1987) and Lovaas and Smith (1989) called for intense early intervention based on the principles of learning theory. They promoted a conscientious application of this approach, proposing that if one well trained professional were assigned to one child with autism on a full time basis for two years, about half the children would attain 'normal' levels of functioning. As well as the personal benefits to the individuals, Lovaas and Smith (1989) estimated that this arrangement would be far more economical in the

long-term and require only 5% of the cost of an alternative arrangement involving lifelong supervision (including special education, hospital and residential care). Despite concerns that methodological issues with the study affected the validity of Lovaas' findings (Jordan, Jones, & Murray, 1998), intensive individualised educational approaches are widely recognised as a priority for promoting long-term quality of life outcomes for children with autism (Roberts & Prior, 2006).

The researcher's philosophy of educational context fits here, where the ideal is a paradigm in which all students are valued members of the community who have access to the settings and programming empirically demonstrated to be most effective for enhancing their long term quality of life (Ashman & Elkins, 2009). Having been conducted in Tasmanian Department of Education schools, this doctoral research on VBI has included students diagnosed with autism who participated in special education settings and would benefit from intensive education programs (Heward & Silvestri, 2005; Roberts & Prior, 2006) as argued by Mock and Kauffman (2005). This doctoral research has also included students diagnosed with autism who participated in the academic programs of mainstream classrooms, in line with the arguments put forward by Dunn (1968).

1.8 Outline of this Research

1.8.1 Aims of the research

In order to further enhance the effectiveness of VBI for students with autism, the aim of this research is to investigate the conditions in which VBI is more likely to succeed and the conditions in which it is less likely to succeed. Within this broader aim, there are two specific research questions that this thesis examines:

1. Can a measure of a participant's imitation ability be used to predict the suitability and the effectiveness of VBI for children with autism?
2. Which model types are more effective as part of VBI for children with autism: adults, peers, siblings, or the participant themselves?

Based on observational learning theory (Bandura, 1977, 1986) it would be predicted that: (1) participants who demonstrate more highly developed imitation skills would be more likely to benefit from VBI than participants who demonstrate less developed imitation skills; and (2) models who have more similar characteristics to and a closer relationship with the participant with autism would be more effective models for VBI - that is, the participant themselves would be the most effective model, followed by siblings, peers, and the least effective model type would be an adult.

In addition to examining the two research questions outlined above, the studies of this research project provide opportunities to explore the impact of other variables on

the effectiveness of VBI. These variables include the participant's severity of autistic impairment, the participant's demonstrated level of adaptive behaviour, and the characteristics of the target behaviour.

1.8.2 *A synopsis of the thesis*

Following this introduction, *Chapter 2* provides a review of the literature on video-based intervention (VBI) for individuals with autism. Focusing on seven review papers and the 61 intervention studies they represent, *Chapter 2* gives an overview of the field, identifying and discussing issues which remain largely unresolved in this relatively new avenue of intervention research. *Chapter 3* provides a background to the methodology, including a brief introduction to the field of applied behaviour analysis (ABA) and single-case research designs. *Chapter 3* also includes a general description of the tools and methods relevant to each of the three VBI studies of this thesis. Table 1-2 provides an overview of the three intervention studies described in *Chapter 4*, *Chapter 5*, and *Chapter 6*.

Table 1-2. Overview of the intervention studies of this doctoral research.

Study / Chapter	Participant			Target behaviour/s	Model type/s
	Name or pseudonym	Diagnosis	Adaptive age equivalent (years : months)		
1/4	Regan	Severe autism	2:9	Unpacking bag, packing bag (generalisation probe), tooth brushing	Adult model
2/5	Matthew	Severe autism	3:8	Coin matching, verbal responses during circle time, preparing noodles	Adult and sibling models
3/6	Nick	Mild autism	6:3	Tying a shoe lace knot	Adult and peer models
3/6	Kayden	Mild autism	6:2	Tying a shoe lace knot	Adult and peer models
3/6	Sean	Severe autism	4:1	Tying a shoe lace knot	Adult and sibling models

Chapter 4 reports on the first intervention study of this doctoral research. This chapter reports on the use of an imitation assessment procedure and explores the utility of a video modelling (VM) procedure to teach two daily living skills to a 12-year-old boy with autism. The participant's obsessive and ritualistic patterns of behaviour were associated with one of the target behaviours for approximately one and a half years

prior to the intervention. The second study is described in *Chapter 5*, in which the same imitation assessment procedure from the previous study was used and a VM intervention was implemented in an attempt to teach three target behaviours to a 15 year-old boy with autism. This VM intervention included both adult-as-model and sibling-as-model conditions to teach a daily living skill, a communication skill, and an academic task. In Study 3 (*Chapter 6*), following the imitation assessment, three boys (aged 10, 9, and 9) with autism received interventions to teach them to tie a shoelace knot. The interventions included the use of peer-as-model (two participants), twin sibling-as-model (one participant), and adult-as-model (all three participants) conditions, as well as a backward chaining procedure (all three participants).

In order to highlight the contribution of this doctoral research, *Chapter 7* concludes the thesis by providing a synthesis of findings from the three studies in the context of previously published literature on VBI. *Chapter 7* also outlines the implications of these findings for future practice and future research.

Chapter 2 - Video-Based Intervention for Individuals with Autism: Key Questions that Remain Unanswered

2.1 Overview

Research on variations of video-based intervention suggests that they can be effective for teaching individuals with disabilities a range of important behaviours. Among the relevant studies and reviews, particular emphasis has been given to applications of these procedures for participants diagnosed with autism. The term 'video-based intervention' (VBI) is a broad term used here to be inclusive of procedures that involve presenting video-footage as the independent variable for intervention. Thus, VBI conceptually includes approaches described as video modelling (VM), video prompting (VP), video self-modelling (VSM), computer-based video instruction and video-priming. Seven specific reviews were identified to provide a broad evaluation of these intervention approaches. The range of target behaviours studied is summarised and a conceptual framework of the procedural types is offered. While various dimensions of intervention effectiveness have been identified, this chapter underscores the important practical and theoretical questions regarding VBI remain largely unanswered.

2.2 Introduction

The nature and prevalence of developmental disabilities such as autism has encouraged the exploration of a plethora of different intervention types in the hope of improving the quality of life for individuals with autism and their families (Green et al.,

2006a; Jacobson et al., 2005b; Metz et al., 2005; Sigafoos et al., 2007a). Among the educational approaches to intervention for this population, an increasing number of research studies have investigated various forms of VBI with the purpose of teaching adaptive behaviours and reducing problem behaviours (Ayres & Langone, 2005; Bellini & Akullian, 2007; Bugghey, 1995b, 2007; Delano, 2007a; Dowrick, 1999; Hitchcock, Dowrick, & Prater, 2003; McCoy & Hermansen, 2007; Mechling, 2005; Sturmey, 2003).

The core explanations for the effectiveness of VBI procedures relate to the principles of observational learning and imitation (Ayres & Langone, 2005; Bandura, 1977; Mechling, 2005; Nikopoulos & Keenan, 2006). While VBI has been used successfully for typically developing individuals as well as people with a range of diagnoses, the preference for visual stimuli and relative strengths in visual processing abilities has been noted as a factor contributing to the success of such interventions for individuals with autism (Bellini & Akullian, 2007; Bugghey, 2005; Nikopoulos & Keenan, 2006).

The relative strength of individuals with autism in regard to processing visual stimuli is well noted in the literature (Ayres & Langone, 2005; McCoy & Hermansen, 2007; Nikopoulos & Keenan, 2006; Sigafoos, O'Reilly, & de la Cruz, 2007c). Kanner (1943), noted that the children he observed seemed to maintain a far better relationship with pictures of people than with the actual people themselves. Also, Grandin (1996) who describes her own life with autism, wrote:

I think in pictures. Words are like a second language to me. I translate both spoken and written words into full-colour movies,

complete with sound, which run like a VCR tape in my head. When somebody speaks to me, his words are instantly translated into pictures. (p. 1)

Imitation abilities are disproportionately impaired in autism, and according to Smith, Lowe-Pearce and Nichols (2006), the majority of recently reported screening measures for autism include at least one item related to imitation. However, using video as a medium reportedly improves stimulus control and attention to the behaviours being modeled (Sturme, 2003). Furthermore, Sigafoos, O'Reilly, and de la Cruz (2007c) suggested that in comparison with some traditional forms of intervention, using video modelling (VM) or video prompting (VP) (types of VBI) may require less expertise, be easier to ensure instructional consistency, be less labour intensive and more cost effective in the long-term. With a primary focus on relevant reviews and their associated intervention studies involving VBI for individuals with disabilities, this chapter provides a discussion of this relatively new field of research and highlights several key questions that, to date, remain unresolved.

2.3 Method of article identification and inclusion

The rationale for using review articles as primary sources for this paper was three-fold. First, this approach would make use of efforts already applied to this field of research and acknowledge the contributions previously made. Second, comparing and contrasting these reviews would assist in providing a broader context for the various VBI procedures that have been studied. Third, this approach would provide greater

confidence in the findings relating to VBI through assessing relevant issues across a number of independent reviewers.

Reviews included in this chapter were located through the following approach:

(a) a search of electronic databases (ERIC and PsycINFO) for studies in which 'video' or 'video-based' or 'videotape' and 'teaching' or 'intervention' or 'modelling' and 'autism' or 'syndrome' or 'disability' appear in the abstract; (b) a second search of electronic databases (ERIC and PsycINFO) using the names of authors' identified through step a; and (c) an ancestral search of the papers identified for inclusion through steps a and b.

Reviews were included on the basis that they: (1) were published in peer-reviewed journals prior to January, 2011; (2) were published in English; (3) provided a formal review of the relevant studies (not intervention studies themselves), having a clearly defined set of inclusion criteria, thus excluding reviews such as that of Buggey (1999) and Dowrick (1999), and which provided more informal discussions of VBI; (4) included studies which used a video-based teaching procedure or intervention (independent variable) to change an aspect of behaviour (dependent variable); (5) included studies which only involved participants who have a condition or diagnosis that constitutes a disability in terms of learning, thus excluding reviews in which studies involving a more general population were included (such as Buggey, 1995b; Meharg & Woltersdorf, 1990); and (6) included at least one study that involved participants diagnosed with an autism spectrum disorder, which excluded the review of Hitchcock, Prater, and Dowrick (2003), as well as the review of Baker, Lang, and O'Reilly (2009) which focused specifically on students with social and emotional disorders.

2.4 General characteristics of the reviews

Seven published reviews were identified that met the inclusion criteria. Two of the reviews were published in 2005 (Ayres & Langone, 2005; Mechling, 2005), three in 2007 (Bellini & Akullian, 2007; Delano, 2007a; McCoy & Hermansen, 2007), and two in 2010 (Kagohara, 2010; Shukla-Mehta, Miller, & Callahan, 2010). These dates suggest that research into the use of VBI has been a recent focus of attention. The increase of research interest in VBI may well be influenced by the increasing availability of the technology required for implementing these intervention procedures (Mechling, 2005). This recent focus on VBI research may also reflect a more general increase in research efforts to identify evidence-based interventions for individuals with disabilities, particularly autism (Bellini & Akullian, 2007; Metz et al., 2005).

The reviews of Mechling (2005), Ayres and Langone (2005), McCoy and Hermansen (2007) and Shukla-Mehta, et al. (2010) included studies that represented a range of VBI approaches. In this regard, McCoy and Hermansen (2007) restricted their review by stating that the intervention study must be ‘...about video modelling’ (p. 186). The review of Mechling (2005) was limited to those articles which utilised instructor created videos. This distinction is particularly interesting in the light of research published after her review in which instructor created videos were more effective than the use of commercially available videos (Palechka & MacDonald, 2010; Rosenberg, Schwartz, & Davis, 2010). Delano (2007a) also excluded studies in which the videotapes were not individualised as well as those which combined a VBI within a package together with other interventions or as a computer-based instructional program. Bellini

and Akullian (2007) excluded interventions that used videos taken from the point-of-view of the participant and those which examined academic outcomes. Similarly, Kagohara (2010) included only studies using VM and VP, in which videos involving content to be modelled was presented.

Five of the reviews examined VBI for individuals diagnosed with an ASD (Bellini & Akullian, 2007; Delano, 2007a; Kagohara, 2010; McCoy & Hermansen, 2007; Shukla-Mehta et al., 2010), while Ayres and Langone (2005) focused on research specifically relating to individuals with a diagnosis of autism. Six of the seven reviews focused exclusively on studies examining VBI for individuals diagnosed with an ASD. The relevance of VBI to this population is also evident in the review of Mechling (2005), who found that about 55% of the participants in the studies she reviewed were diagnosed with autism, even though the review was inclusive of a wide range of disabilities. Thus, VBI is positioned in the literature as an intervention approach with particular relevance for individuals diagnosed with an ASD.

Four of these seven reviews did not exclude studies on the basis of their date of publication (Ayres & Langone, 2005; Kagohara, 2010; McCoy & Hermansen, 2007; Shukla-Mehta et al., 2010), although the hand search procedure of Kagohara only went back as far as 1989. The review of Bellini and Akullian (2007) covered studies from 1980 to 2005, and that of Delano (2007a) from 1985 to 2005. A comparatively narrow timeframe of research was investigated by Mechling (2005), confining her review to studies published in 1999 to 2003 inclusive. Nevertheless, Mechling (2005) identified 24 studies which met her inclusion criteria.

A total of 61 different articles (some with more than one study) describing VBI studies were represented in the seven reviews. Single-case research designs were used in all but one of the studies examined (Kroegeer, Schultz, & Newsom, 2007). A summary of these studies is presented in alphabetical order in Table 2-1. Though differences in the approach, aims, focus and scope of the seven reviews are apparent, taken cumulatively, their main findings do provide some consensus regarding VBI studies and research.

Table 2-1. A summary of the video-based intervention studies included in the seven review papers.

Number	Article reference	Reviewed by	Target behaviour / skills	Summary of the procedure	Outcome
1	Alcantara (1994)	Ayres and Langone (2005), Bellini and Akullian (2007), Kagohara (2010), McCoy and Hermansen (2007)	Purchasing skills	Videos in which a familiar and unfamiliar adult modelled the target behaviours	The intervention was effective for the acquisition of 28/32 shopping skills steps VM plus live training for last 4 steps
2	Apple, Billingsley, and Schwartz (2005)	Bellini and Akullian (2007), Delano (2007a), Kagohara (2010), McCoy and Hermansen (2007), Shukla-Mehta et al. (2010)	(Two studies) Giving and responding to compliments	Videos involving typical familiar peer models with adult explanations	The VM procedure increased compliment related skills, and combining VM with self-management improved the intervention efficacy
3	Ayres and Langone (2002)	Mechling (2005)	Purchasing skills	Multimedia program using videos of cashiers as model within a local grocery store	The results were inconclusive due to time constraints but suggest positive intervention effects for 2/3 participants where data were available
4	Ayres and Langone (2007)	Kagohara (2010)	Putting away groceries	Comparison of videos using first-person and third-person performing the target behaviour	All four participants met criterion but generalisation was limited

Number	Article reference	Reviewed by	Target behaviour / skills	Summary of the procedure	Outcome
5	Bellini, Akullian, and Hopf (2007)	Kagohara (2010), Shukla-Mehta et al. (2010)	Unprompted social engagement with same-age peers (pre-school)	Participants were shown edited videos of themselves engaging positively with their peers	The VSM intervention led to rapid and substantial increases in the target behaviour for both participants
6	Bernad-Ripoll (2007)	Kagohara (2010),	Recognition of emotions and identification of appropriate actions to accompany emotions	Social stories with discussion were used in conjunction with videos of the participant himself as the model	The intervention was effective in teaching the participant to understand his own emotions and generalise these understanding to other situations
7	Branham, Collins, Schuster, and Kleinert (1999)	Mechling (2005)	Mailing a letter, cashing a cheque, and crossing a street	A comparison of conditions including community-based instruction plus either classroom simulation, videotape modelling, or both	The most efficient procedure was the combination of classroom simulation and community-based instruction
8	Buggey (2005)	Bellini and Akullian (2007), Delano (2007a), Kagohara (2010), McCoy and Hermansen (2007), Shukla-Mehta et al. (2010)	(Three studies) (1) social interactions; (2) tantrums reduction; (3) Pushing classmates reduction and language production	All used a VBI which involved the participant as the model in videos which were edited to show only positive and appropriate responses related to the target behaviours	Positive for all three studies and all 5 participants – the intervention led to (1) increased social interactions; (2) reduced time and frequency of tantrums; (3) elimination of pushing behaviour and increase in

Number	Article reference	Reviewed by	Target behaviour / skills	Summary of the procedure	Outcome
					language production
9	Buggey, Toombs, Gardener, and Cerevetti (1999)	Bellini and Akullian (2007), Delano (2007a), Kagohara (2010), Mechling (2005), Shukla-Mehta et al. (2010)	Verbal responses	Videos in which the participant served as the model that were edited to show only positive and appropriate responses related to the target behaviours	Increases in appropriate verbal responses were reported for all three participants
10	Charlop and Milstein (1989)	Ayres and Langone (2005), Bellini and Akullian (2007), Delano (2007a), Kagohara (2010), McCoy and Hermansen (2007), Shukla-Mehta et al. (2010)	Conversational speech	Videos in which a familiar adult modelled scripted conversations	Positive intervention, generalisation and maintenance effects were reported
11	Charlop-Christy and Daneshvar (2003)	Delano (2007a), Kagohara (2010), McCoy and Hermansen (2007), Mechling (2005), Shukla-Mehta et al. (2010)	Perspective taking skills	Videos in which a familiar adult model demonstrated the target behaviours	Positive effects of the procedures were reported for 2/3 participants
12	Charlop-Christy, Le, and Freeman (2000)	Ayres and Langone (2005), Bellini and Akullian (2007), Delano (2007a), Kagohara (2010), McCoy	Range of language, social play, daily living, and other skills based on	Compared the interventions of videos using familiar adult models against live modelling	Overall, the VM procedure was found to be more effective than live modelling and resulted in generalisation whereas live

Number	Article reference	Reviewed by	Target behaviour / skills	Summary of the procedure	Outcome
		and Hermansen (2007), Mechling (2005), Shukla-Mehta et al. (2010)	individual needs	from familiar adult models	modelling did not
13	Corbett (2003)	Kagohara (2010)	Recognition of four basic emotions: happy, sad, angry, and afraid	Presentation of videos displaying peer models expressing the four emotions together with correction and role-play of the emotions	The intervention led to recognition of the emotions and was generalised to other people and scenarios
14	Coyle and Cole (2004)	Bellini and Akullian (2007), Kagohara (2010)	Off-task behaviour (reduction)	Video self-modelling and self-monitoring program	Considerable decreases in off-task behaviour were reported, as well as evidence to support maintenance effects
15	D'Ateno, Mangiapanello, and Talyor (2003)	Bellini and Akullian (2007), Delano (2007a), Kagohara (2010), McCoy and Hermansen (2007), Mechling (2005), Shukla-Mehta et al. (2010)	Solitary play skills	Videos in which an adult model demonstrated scripted play sequences	Increases in the play behaviours modelled were reported as a result of the intervention
16	Dauphin, Kinney, and Stromer (2004)	Kagohara (2010), McCoy and Hermansen (2007)	Socio-dramatic play skills	Computer activity schedule in which videos of a peer model demonstrating the target	The video-based intervention with teacher prompting increased scripted and

Number	Article reference	Reviewed by	Target behaviour / skills	Summary of the procedure	Outcome
				behaviour were presented	unscripted play skills
17	Delano (2007b)	Kagohara (2010)	Number of appropriate words and functional essay elements	Participants were involved in producing and viewing themselves modelling a self-monitoring strategy for the number of words and a modelling a strategy to plan and write a persuasive essay	The intervention improved the three participants' performance of the target behaviours but the maintenance of these gains was limited
18	Embregts (2000)	Mechling (2005)	Violence, screaming and throwing objects (reduction)	Package involving video feedback and self-management	A statistically significant decrease in the target behaviours was reported but there was no associated generalisation reported
19	Embregts (2002)	Mechling (2005)	Increase of appropriate behaviours such as compliments, affection, or neutral statements, and reduction of inappropriate behaviours such as shouting, hitting, pushing or verbal insults	Package involving video feedback and self-management	An increase in appropriate behaviour following the intervention was reported, but results were inconsistent regarding the inappropriate behaviour targeted for intervention

Number	Article reference	Reviewed by	Target behaviour / skills	Summary of the procedure	Outcome
20	Embregts (2003)	Mechling (2005)	Internalising or externalising behaviour problems	Package involving video feedback and self-management	Increases in appropriate behaviours and decreases in inappropriate behaviours were reported particularly for externalising behaviours but follow-up data did not demonstrate positive maintenance effects
21	Gena, Couloura, and Kymissis (2005)	Kagohara (2010), McCoy and Hermansen (2007), Shukla-Mehta et al. (2010)	Appropriate verbal and facial responses in affective scenarios	Live modelling by the experimenter compared with videos of a peer displaying appropriate affective responses	Positive intervention effects and generalisation for both interventions
22	Hagiwara and Myles (1999)	Ayres and Langone (2005), Bellini and Akullian (2007), Kagohara (2010), McCoy and Hermansen (2007), Mechling (2005)	Hand washing and increasing on task behaviour	Multimedia presentation of a social story	Positive intervention effects were not clearly demonstrated
23	Haring, Breen, Weiner, Kennedy, and Bednersh (1995)	Kagohara (2010), McCoy and Hermansen (2007)	Purchasing skills	(1) In-vivo instruction followed by videotape training; (2) videotape training followed by in vivo instruction; and (3) concurrent	Positive effects for all interventions and generalisation when videotape and in vivo modelling were used together

Number	Article reference	Reviewed by	Target behaviour / skills	Summary of the procedure	Outcome
				videotape and in vivo instruction	
24	Haring, Kennedy, Adams, and Pitts-Conway (1987)	Ayres and Langone (2005), Bellini and Akullian (2007), Delano (2007a), Kagohara (2010), McCoy and Hermansen (2007)	Purchasing skills	Videos in which the participants viewed videotapes of models who purchased items in the probe settings and answered questions about the models' responses before performing the behaviour in the stores	The intervention resulted in effective generalization of the purchasing skills to the 3 community stores
25	Hine and Wolery (2006)	Kagohara (2010), McCoy and Hermansen (2007), Shukla-Mehta et al. (2010)	Social play skills	Videos showing adult hands demonstrating the play skills from the subjective point-of-view	The intervention was effective for teaching 3 of the 4 behaviours and using reinforcements and prompting led to acquisition of the 4th
26	Keen, Brannigan, and Cuskelly (2007)	Kagohara (2010)	In-toilet urinations	An animated toilet training video was shown together with the use of operant conditioning principles compared with just operant conditioning principles	Greater gains were found for participants who were exposed to the VM package, with three participants demonstrating maintenance of gains and two participants generalised gains to a new setting

Number	Article reference	Reviewed by	Target behaviour / skills	Summary of the procedure	Outcome
27	Kinney, Vedora, and Stromer (2003)	Kagohara (2010), McCoy and Hermansen (2007)	Generative spelling	PowerPoint computer program in which videos of adult models experimenters demonstrated the target behaviours	Increases in generative spelling skills were recorded as a result of the intervention
28	Kroeger et al. (2007)	Kagohara (2010), Shukla-Mehta et al. (2010)	Social responses, interactions, and initiations	Comparison of unstructured play and direct instruction through VM	Both experimental groups made gains in their pro-social behaviours, but those of the VM group were greater
29	Kyhl, Alper, and Sinclair (1999)	Mechling (2005)	Grocery related sight words	Interactive VP together with instructor feedback and correction	The procedure led to acquisition, maintenance and generalisation of the grocery related sight words
30	Lancaster, Schumaker, and Deshler (2002)	Mechling (2005)	Communication strategies for Individual Education Plan (IEP) conferences	Compared interactive lessons using audio, text, and videos of peer instructors describing and modelling the strategies with teacher lecture with paper handouts	Increased responses to questions were reported as a result of both conditions and generalisation of response during actual IEP meetings was slightly higher for the interactive hypermedia intervention
31	Lasater and Brady	Ayres and Langone (2005), Bellini and Akullian	Self-help skills	Intervention package including self-assessment,	The video instructional package was effective for increasing task

Number	Article reference	Reviewed by	Target behaviour / skills	Summary of the procedure	Outcome
	(1995)	(2007), Kagohara (2010), McCoy and Hermansen (2007)		behaviour rehearsal, and self-modelling via videotape feedback	fluency and generalisation of skills as well as reducing task-interfering behaviour
32	Le Blanc et al. (2003)	Delano (2007a), Kagohara (2010), McCoy and Hermansen (2007), Mechling (2005), Shukla-Mehta et al. (2010)	Perspective taking	VBI with reinforcement and replay for correction using adult model	Positive for teaching the perspective taking skill and generalisation for two of the three participants
33	MacDonald, Clark, Garrigan, and Vangala (2005)	Bellini and Akullian (2007), Kagohara (2010), McCoy and Hermansen (2007), Shukla-Mehta et al. (2010)	Pretend play	Videos in which an adult model acted out play scripts	Increases were recorded for the scripted play behaviours but no generalisation to unscripted play was observed
34	MacDonald, Sacramone, Mansfield, Wiltz, and Ahearn (2009)	Kagohara (2010)	Reciprocal pretend play	Videos in which an adult model acted out play scripts	The intervention led to increases in scripted verbalisations which were maintained at one month, with increases in unscripted verbalisations (generalisation) also reported
35	Maione and Mirenda (2006)	Kagohara (2010), Shukla-Mehta et al. (2010)	Social language directed to peers during play	Videos with adult models talking and playing appropriately, as well as video	VM alone led to increases in social language for two activities while the third required video

Number	Article reference	Reviewed by	Target behaviour / skills	Summary of the procedure	Outcome
				feedback which involved a discussion about videos showing the participant and a peer interacting	feedback and prompting in addition to the VM to be effective
36	Marcus and Wilder (2009)	Kagohara (2010)	Identifying or labelling novel letters	The effect of VM (peer model) and VSM was compared	All three participants achieved mastery in the VSM condition, while only one achieved mastery in the VM condition
37	Mechling, Gast, and Langone (2002)	Mechling (2005)	Grocery shopping skills including word and sign recognition as well as location of items	Computer-based video instruction CBVI involving video captions paired with still photographs	Increased performances in entering the correct aisles and item location was reported for the three stores used in the videos as well as generalising to other stores
38	Mechling and Gast (2003)	Mechling (2005)	Grocery shopping skills matching words on a grocery list with words on the aisle signs	Computer-based video instruction (CBVI) involving video captions paired with still photographs	All three participants were able to match the relevant words and aisle signs in grocery stores shown in the videos as well as novel locations
39	Mechling, Gast, and Barthold (2003)	Mechling (2005)	Using a debit card to make purchases	VM of the steps involved in the target behaviour from the subjective-point of view and	All three participants generalised the skill to be able make purchases at real life stores

Number	Article reference	Reviewed by	Target behaviour / skills	Summary of the procedure	Outcome
				including embedded prompts	and those not shown in the videos
40	Mechling and Langone (2000)	Mechling (2005)	Photograph recognition for prompting augmentative communication	Computer-based video instruction (CBVI) involving video captions paired with still photographs	An increase of photographs selected was reported as well as the skill being generalised to the participants' augmentative communication devices
41	Mechling, Pridgen, and Cronin (2005)	Bellini and Akullian (2007)	Purchasing skills	Computer-based video instruction (CBVI) involving adult models demonstrating the target behaviours	Positive intervention effects were reported for the target behaviours through this procedure
42	Murzynski and Bourret (2007)	Kagohara (2010)	Daily living skills, including sandwich making, juice making, shirt folding, and pant folding	VM (adult model) plus least-to-most intrusive prompting was compared with least-to-most prompting alone	VM plus least-to-most prompting was more effective in teaching the response chains to the two participants than least-to-most prompting alone
43	Nikopoulos and Keenan (2003)	Bellini and Akullian (2007), Delano (2007a), Kagohara (2010), Shukla-Mehta et al. (2010)	Social initiations related to play behaviour	Videos in which a non-handicapped peer, a familiar adult and a familiar adult modelled the target behaviours	Positive intervention effects were reported for four of the seven participants, with maintenance and generalisation of the target behaviours associated with these

Number	Article reference	Reviewed by	Target behaviour / skills	Summary of the procedure	Outcome
					gains
44	Nikopoulos and Keenan (2004a)	Bellini and Akullian (2007), Delano (2007a), Kagohara (2010), McCoy and Hermansen (2007), Shukla-Mehta et al. (2010)	Social initiations related to play behaviour	Videos involving a peer model initiating play with the experimenter were shown to participants	The interventions resulted in enhanced social initiations and increased time engaged in reciprocal play
45	Nikopoulos and Keenan (2004b)	Kagohara (2010), Shukla-Mehta et al. (2010)	Social initiations and reciprocal play	Videos involving a peer model engaging in reciprocal play with the experimenter were shown to participants	The interventions resulted in enhanced social initiations and increased time engaged in reciprocal play, with gains being maintained at 3 months follow-up and generalising across toys, settings, and peers
46	Nikopoulos and Keenan (2007)	Kagohara (2010), Shukla-Mehta et al. (2010)	Complex social sequences: social initiations and reciprocal play	Videos involving a peer model performing the social sequences were shown to participants	The interventions resulted in enhanced social initiations, increased time engaged in reciprocal play, and increased imitative responding of behaviours with gains being maintained at 2 months follow-up

Number	Article reference	Reviewed by	Target behaviour / skills	Summary of the procedure	Outcome
47	Norman, Collins, and Schuster (2001)	Ayres and Langone (2005), Bellini and Akullian (2007), Kagohara (2010), McCoy and Hermansen (2007), Mechling (2005)	Self-help skills	VM and VP procedure in which the target behaviours were demonstrated from a subjective point-of-view	The procedure was effective for teaching the self-help skills which were maintained and generalised to other instructors and materials
48	Ogletree, Fischer, and Sprouse (1995)	Ayres and Langone (2005), Kagohara (2010)	Semantic and pragmatic language skills	Viewing and discussion of a 5 minute video from a Disney film	Increase in topic maintenance but no change in response latency and little confidence in any intervention effect on eye gaze
49	Paterson and Arco (2007)	Kagohara (2010), Shukla-Mehta et al. (2010)	Generalised independent toy play	Videos showing an adult model engaging in appropriate verbal and motor play with one of the toys	The VM led to an increase in appropriate play but generalisation was limited to similar toys
50	Reagon, Higbee, and Endicott (2006)	Kagohara (2010), McCoy and Hermansen (2007)	Pretend play – four scenarios with the participant's brother	Videos involving the participant's brother and a typical peer as models	The videos alone were effective for increasing scripted and unscripted pretend play
51	Reeve, Reeve, Townsend, and Poulson (2007)	Shukla-Mehta et al. (2010)	Helping behaviours: locating objects, putting items away, setting up an activity, carrying objects, cleaning,	The intervention package included multiple-exemplar training, VM (adult and peer), prompting, and reinforcement	Each of the four children learned to perform the helping behaviours, generalisation to other helping behaviours was observed and maintenance of the

Number	Article reference	Reviewed by	Target behaviour / skills	Summary of the procedure	Outcome
			replacing broken materials		helping behaviours was reported from follow-up 60 days post-intervention
52	Sansosti and Powell-Smith (2008)	Kagohara (2010)	Social communication skills: 'joining in' and maintaining conversations	The intervention package involved presenting social stories and video models through a computer	The package led to improvements in the three participants' social communication skills, but two participants required access to social reinforcement and generalisation was observed for only one participant
53	Scattone (2008)	Kagohara (2010), Shukla-Mehta et al. (2010)	Conversation skills, including: eye contact, smiling, and initiations	Videotaped social stories with two adults modelling the target behaviours plus five minutes of social interaction	The intervention led to an increase in two of the three target behaviours and the participant was reported to generalise some of these gains to conversations with peers at school
54	Schreibman et al. (2000)	Ayres and Langone (2005), McCoy and Hermansen (2007), Mechling (2005), Shukla-Mehta et al. (2010)	Disruptive transition behaviour (reduction)	Video footage of transitions shown from a subjective point-of-view as a priming procedure	The interventions were effective in reducing disruptive behaviour associated with transitions for all participants

Number	Article reference	Reviewed by	Target behaviour / skills	Summary of the procedure	Outcome
55	Sherer et al. (2001)	Ayres and Langone (2005), Bellini and Akullian (2007), Delano (2007a), Kagohara (2010), Mechling (2005), Shukla-Mehta et al. (2010)	Conversation skills	A comparison of two procedures: (1) The use of a video showing a peer; and (2) use of the participant themselves acting as model, in which the participants viewed edited videos of themselves showing only appropriate responses	Two participants achieved task acquisition quickly, one participant did so more slowly and the remaining two participants failed to do so. There was no reportable difference between the effectiveness of peer-as-model or self-as-model conditions
56	Shipley-Benamou et al. (2002)	Ayres and Langone (2005), Bellini and Akullian (2007), Delano (2007a), Kagohara (2010), McCoy and Hermansen (2007), Mechling (2005)	Functional living skills including: making orange juice; preparing a letter to be mailed and putting a letter in the mailbox; setting a table; cleaning a fish bowl; and feeding a cat	Videos involving an adult model whose hands were visible demonstrating the tasks from a subjective point-of-view	The intervention resulted in rapid acquisition of the target behaviours which were maintained after the withdrawal of intervention and at follow-up
57	Sigafoos et al. (2005)	McCoy and Hermansen (2007)	Making microwave popcorn	Videos from the subjective point-of-view demonstrating the steps involved in the target behaviour with the model providing narration	Positive intervention effects were reported for 2 of the 3 participants and these gains were maintained after the intervention was withdrawn

Number	Article reference	Reviewed by	Target behaviour / skills	Summary of the procedure	Outcome
58	Simpson, Langone, and Ayres (2004)	Ayres and Langone (2005), Bellini and Akullian (2007), McCoy and Hermansen (2007), Shukla-Mehta et al. (2010)	Social skills following directions, greetings and sharing	Videos involving two peers without disabilities and of similar age to participants modelling appropriate target behaviours	The intervention increased independent use of the target skills
59	Taylor, Levin, and Jasper (1999)	Ayres and Langone (2005), Bellini and Akullian (2007), Delano (2007a), Kagohara (2010), McCoy and Hermansen (2007), Mechling (2005), Shukla-Mehta et al. (2010)	Play-related statements with siblings	(Two studies) (1) Videos involving siblings modelling scripted comments; and (2) videos involving siblings modelling unscripted comments	Increases in the targeted play-related statements were achieved through the use of both of the intervention procedures
60	Thiemann and Goldstein (2001)	Ayres and Langone (2005), Bellini and Akullian (2007), McCoy and Hermansen (2007), Mechling (2005)	Social interaction	Package involving ten minutes instruction using visual stimuli, ten minutes social interaction and a VBI component of ten minutes of self-evaluation using video feedback	Some increases in targeted behaviours but generalisation effects were quite restricted
61	Wert and Neisworth (2003)	Ayres and Langone (2005), Bellini and Akullian (2007), Delano (2007a), Kagohara (2010), McCoy	Spontaneous requesting	Participants watching videos of themselves which had been edited to show only appropriate independent	The intervention led to increases in the spontaneous requesting for all participants

Number	Article reference	Reviewed by	Target behaviour / skills	Summary of the procedure	Outcome
		and Hermansen (2007), Mechling (2005), Shukla- Mehta et al. (2010)		performances of the target behaviour	

2.5 The range of behaviours targeted for intervention

Each of the seven reviews described a range of behaviours that have been the focus of VBI studies. Only two reviews placed formal restrictions for inclusion of studies on the basis of the target behaviour. Bellini and Akullian (2007) excluded studies targeting academic skills, while the review of Shukla-Mehta et al.(2010) focused on social and/or communication skills to the exclusion of functional and academic skills. Although Kahohara (2010) only included interventions that developed the ‘child’s adaptive behaviour or academic skills’ (p. 131), this criteria still permitted a broad range of target behaviours. The reviewers showed some variation in their approach to categorising the target behaviours of the studies they investigated.

Ayres and Langone (2005) structured their review around the two target skill domains of social skills (involving nine studies); and functional skills (seven studies). They related the target behaviours of the studies on the basis of the distinctive traits of autistic behaviour as described by the American Psychiatric Association (2000). Others either did not describe a rationale, or utilised a more grounded or pragmatic approach. Bellini and Akullian (2007) divided the target behaviours into social-communication (16 studies); functional skills (eight studies); and behavioural functioning (three studies). A similar approach was used by Kagohara (2010) with the categories of social or communication skills (34 studies), daily living skills (nine studies), and reduction of problem behaviour (five studies). Four areas for instruction were described in the review by Delano (2007a), including social-communicative behaviours (12 studies); functional skills (two studies); perspective taking skills (two studies); and problem behaviour (two studies). Mechling

(2005) categorised studies into those which measured communication (seven studies); community skills (six studies); behaviour-related skills (five studies); social skills (three studies); self-help skills (two studies); and daily/home living skills (one study). As McCoy and Hermansen (2007) investigated the effect of the type of model used for VM interventions, their summary of target behaviours related to each type of independent variable, rather than describing categories of target behaviours.

In the light of these different reviews, VBI studies could be summarised as those aimed at: (1) improving and increasing social interactions; (2) improving and increasing the use of language/communication; (3) teaching functional skills; (4) increasing the consistency of appropriate behaviours and/or reducing problem behaviours; and (5) teaching academic skills.

2.6 The procedural types used

There are differences among the reviews as to their specific focus of intervention types. Mechling (2005) only included studies in which the videos used were personally created by the instructor, as opposed to commercial software or feature films. Mechling (2005) used six categories to describe different VBI procedures, including: (1) video feedback; (2) VM; (3) video self-modelling; (4) subjective point-of-view; (5) interactive video instruction; and (6) computer-based video instruction. Mechling described video feedback (VF) as procedures in which participants viewed their own previous performance (including both positive and negative performances) via video. VM denoted studies that involved showing the participant videos with a model (peer or adult) performing the target

behaviour. Video self-modelling (VSM) was defined in similar terms to VM, except that in VSM the participants themselves served as the model. The point-of-view approach is where the videos presented to the participant were filmed from the perspective of the person actually performing the target behaviour. Video instruction/video prompting described interventions in which the participant was required to watch a portion of the video and then respond to specific prompts, rather than watch the whole video and then perform the whole target behaviour. The final approach described by Mechling (2005) was referred to as 'computer-based video instruction' (CBVI) and was used interchangeably with 'multimedia'. In this approach, a computer is used to interactively present a variety of media (including text, music, pictures and video footage) to the participant. Seven studies included in the review of Mechling were described as computer-based video instruction (CBVI), and four of those studies involved Mechling as the first-named author (Mechling & Gast, 2003; Mechling et al., 2003; Mechling et al., 2002; Mechling & Langone, 2000).

The focus of McCoy and Hermansen's (2007) review was on the types and effects of different models. Thus, their interventions were categorised into five different model types: (1) adults; (2) peers; (3) self; (4) point-of-view; and (5) mixed model approaches. One limitation with this approach was that the procedures described as using 'mixed model approaches' overlapped with other categories.

In contrast to the reviews of Mechling (2005) and McCoy and Hermansen (2007), Bellini and Akullian (2007) distinguished between point-of-view videos which showed hands or other parts of the model's body and those that did not show the model at all. The former they described as 'first-person' and included (such as in Norman et al., 2001), while

the latter were excluded (such as Schreibman et al., 2000, in which video priming was examined). Bellini and Akullian (2007) included studies that assessed the efficacy of video modelling or VSM interventions. Their emphasis on this distinction and categorisation was also apparent through their quantitative comparison between the effectiveness of VM and VSM procedures. Similarly, Delano (2007a) used 'other as model' and 'self as model' as primary categories for the different intervention approaches in their review. Having discussed their findings in relation to 'social' and 'functional' skills, Ayres and Langone (2005) included studies that used videos showing a variety of model types (adults, peers and self), those which were presented from the first person point of view, as well as a study by Ogletree, Fischer, and Sprouse (1995) in which a segment from a Disney movie was used as part of an intervention.

As well as describing the independent variable of studies in terms of type of model, Kagohara (2010) reported on whether the studies' intervention involved reinforcement procedures and other additional strategies. In addition, Kagohara noted the medium through which the videos were presented: 14% through computer, leaving 86% being presented through television and VCR player. Shukla-Mehta, et al. (2010) distinguished between studies in which the VBI was implemented: (a) without other intervention components (four studies); (b) as the primary intervention with additional components (five studies); (c) a component of an intervention package (eight studies); and (d) in comparison to other another intervention strategy (three studies).

2.7 The effectiveness of video-based interventions

Though the seven reviews differed in focus and approach, they were unanimous in describing applications of VBI as successful, leading to positive outcomes overall. Ayres and Langone (2005) provided generally positive reports on the effectiveness of the VBI studies for both social skills and functional skills. Similarly, Delano (2007a) suggested that VM may be a useful approach to treating some of the central deficits associated with autism. With results discussed according to procedural types, McCoy and Hermansen (2007) noted positive intervention effects for VBI that used adults, peers and self as models as well as videos shown from the first-person perspective for participants with autism. Mechling (2005) calculated that about 91% of the instructor-created video programs included in their review reported positive intervention effects. Kagohara (2010) reported that 55% of the studies they reviewed provided evidence of positive intervention effects for all participants, and without modification of or addition to the independent variable.

Shukla-Mehta et al. (2010) argued that the studies they reviewed provided some evidence to support the use of VM (including point-of-view video modelling) and VSM for teaching social and communication skills to students with ASD. On the basis of criteria from Horner et al. (2005), such as the requirement that a functional relationship between the intervention and the target behaviour be reliably demonstrated across a number of studies, researchers and participants, Bellini and Akullian's (2007) concluded that VM and VSM should be recognised as evidence-based practices for children and adolescents with an ASD. Eighteen of the studies reviewed by Bellini and Akullian (2007) provided measures of maintenance, with a mean percentage of 83% non-overlapping data points (PND). Positive

maintenance of the target behaviours was also reported by Delano (2007a) for all 14 of the studies that provided maintenance data.

Seven studies reviewed by Bellinini and Akullian (2007) measured generalization, with a mean PND of 74%. Mechling (2005) also argued that the nature of VBI, its portability and opportunity to include footage from other locations in the community, promotes generalization of target behaviours to settings other than where the intervention took place. Delano (2007a) reported on ten studies that assessed generalization. Three of these studies assessed generalization across settings, people, and materials. Delano (2007a) noted that positive generalization occurred for social-communicative behaviours, functional living skills, and perspective taking skills. Also, in a comparative study, Charlop-Christy, Le, and Freeman (2000) reported that using VM more effectively promoted the acquisition as well as the generalization of adaptive behaviours than using live modelling. Considering that individuals with autism often have difficulty generalising behaviours learned through traditional methods (Lovaas, Koegel, & Schreibman, 1979; McGee, Krantz, & McClannahan, 1985) the results of Charlop-Christy, Le, and Freeman's (2000) study, reported in all seven of the reviews discussed here, lend considerable support for the relevance of VBI for this population.

Five studies reviewed by Delano (2007a) reported specific (positive) measures of social validity. Because watching videos is considered a desirable and socially acceptable practice among typically developing individuals (Bellini & Akullian, 2007), VBI procedures can be seen as a socially valid and relatively non-invasive approach for the education of individuals with developmental disabilities such as autism.

One practical advantage of VBI is the ability to accurately repeat the instruction and provide consistency of modelled behaviour, as well as the increasing availability and usability of digital video equipment (Ayres & Langone, 2005). Delano (2007a) and Mechling (2005) estimated that less staff time was required, thus less long-term costs were associated with VBI in comparison to using live models; this was because videos have become easier to produce and intervention procedures have been quick to implement – taking as little as a few minutes each day. Therefore, VBI procedures are recommended to the teachers, carers, and practitioners who work with individuals with disabilities - particularly those with autism.

2.8 Unanswered questions

The current research literature is generally in agreement that VBI is socially valid approach that can lead to positive outcomes for individuals with autism. Even so, a number of unresolved questions regarding VBI for individuals with autism remain, due to combination of factors, including: (1) the relative recent research focus on VBI for individuals with autism; (2) the limitations in the generality of findings from isolated studies using single-case research designs; and (3) the scarcity of studies comparing the effectiveness of VBI across participants, across target behaviours, and across independent variables.

2.8.1 *Can we predict whether an individual is suited to VBI?*

In terms of students with autism, research has provided little definitive evidence to demonstrate who is more likely and less likely to benefit from VBI, nor has there been

research in support of measures for predicting participants' success with VBI (Mechling, 2005). Despite the consensus that VBI procedures, such as video modelling (VM), video prompting (VP) and video self-modelling (VSM) can be effective for teaching adaptive behaviours to individuals with developmental disabilities such as autism, a number of studies have reported mixed results among participants (Apple et al., 2005; Charlop-Christy & Daneshvar, 2003; D'Ateno et al., 2003; Nikopoulos & Keenan, 2003; Sherer et al., 2001; Taylor et al., 1999). In response to this variability, Delano (2007a) suggested that individual characteristics, such as visual processing and language skills as well as rates of problem behaviour, may influence the effectiveness of VM interventions. However, Delano (2007a) was unable to report on any formal evaluation of the relationships between these variables and VBI procedures. McCoy and Hermansen (2007) discussed the role imitation and attention skills may have in enabling or disabling individuals to profit from VM interventions. They noted that:

Although these two components logically seem like a critical pre-requisite for successful video modelling implementation, the 34 studies reviewed did not consistently report on whether or not participants had attending and imitation skills prior to the implementation of the study. (McCoy & Hermansen, 2007, p. 206)

Some procedures have been used to assess and to promote what were considered pre-requisite skills for VM interventions. As part of implementing VM interventions for children with autism, Nikopoulos and Keenan (2003, 2004a, 2006) required all participants to be able to watch television for at least one minute, and provided training to achieve this, if necessary. This procedure was based on the premise that the learner's ability to attend to

the specific behaviours being modelled was an important prerequisite for effective interventions based on modelling, and is provided as a guideline by Shukla-Mehta et al. (2010).

Buggey (personal communication, January 15 and 17, 2008) has expressed a similar perspective on the prerequisite skills necessary for effective VSM procedures. He suggested that VSM procedures are useful for individuals with developmental ages from between 18 and 24 months and that the developmental age necessary to profit from VSM is related to the development of self-recognition. Based on his experience with several studies using VSM, Buggey (1995a, 1995b, 1999, 2005, 2007) and colleagues (Buggey et al., 1999) have used the participant's self-recognition (on video) and their ability to attend as the pre-requisites for this intervention approach. According to Buggey, this strategy is supported by research across three early intervention classrooms for children aged from birth to one year, from one to two years, and from two to three years (T. Buggey, personal communication, January 17, 2008).

Among the studies that did report on prerequisites, there was little empirical data on such skills or abilities for useful comparison between participants. For example, researchers such as MacDonald, Clark, Garrigan, and Vangala (2005) have suggested that imitation ability and observational learning are pre-requisites for effective VM, but did not provide objective measures to describe these abilities of their participants. Similarly Norman, Collins, and Schuster (2001) described the prerequisite skills for participation in their intervention as including: (a) motor imitation, (b) visual and auditory acuity within normal functioning limits, (c) identified reinforcers, and (d) a wait response of 5 seconds. Other

researchers (such as Branham et al., 1999; Sigafos et al., 2007b; Sigafos et al., 2005) have also carried out evaluations of participants' prerequisite skills relevant to their own study as well as providing demographic information. Nevertheless, these studies did not provide a quantified description of the prerequisite imitation skills that could inform a comparison between participants outside the study.

In terms of participant prerequisite skills, Hine and Wolery (2006) went a step further, administering the *Motor Imitation Scale* (Stone, Ousley, & Littleford, 1997) in the context of their VM study. The two participants in their study were effective imitators for their developmental age, with scores of 29 and 30 from a potential 32 points. With these results, future research is needed to investigate the use of VBI with participants who represent a range of imitation skills in order to describe the relationship between such prerequisites and intervention success. Also, the use of the *Motor Imitation Scale* may not be ideal for providing a general measure of imitation, as it focuses exclusively on motor imitation.

Thus, while some researchers have employed reasonable measures to ensure participants in VBI have the necessary pre-requisite skills, this field still lacks predictive tools, measures or indicators that: (1) have been empirically evaluated to predict success with VBI; and (2) are suitable for use in conjunction with the various procedural types and for a range of target behaviours. If VBI is to be a useful part of the repertoire for educators and other professionals, knowing whether an individual would or would not benefit from such approaches would be of practical benefit. Research investigating the relationship between variables, such as measures of developmental age, imitation abilities, and severity

of autistic impairment with the effectiveness of VBI are of practical and theoretical interest in terms of understanding the nature of autism itself. These issues have provided direction for the imitation assessment procedures in the three intervention studies described in this thesis.

2.8.2 What type of model is most effective?

All seven of the reviews suggested that future VBI research should involve further comparative studies which examine the effects of different model types on the outcome of VBI for individuals with an ASD (Ayres & Langone, 2005; Bellini & Akullian, 2007; Delano, 2007a; Kagohara, 2010; McCoy & Hermansen, 2007; Mechling, 2005; Shukla-Mehta et al., 2010). While Shukla-Mehta et al. (2010) acknowledged that different types have been used successfully and did not report a difference in intervention effect, they note that VSM may be less efficient than VM, due to the practical issues surrounding the implementation of VSM. Feedforward procedures (one VSM approach) require producing videos showing the participant performing at a previously unattained level. This restriction may represent a real challenge for many target behaviours. Feedforward procedures have been shown to suit specific target behaviours, such as selective mutism (Dowrick & Hood, 1978), that involve editing and combining videos from two settings, but it could be extremely difficult to use feedforward for behaviours where the participant has not shown any performance of the target behaviour suitable for imitation. Although it may be somewhat easier to produce positive self-review videos compared with those for feedforward, similar restrictions to the target behaviour would apply: the behaviour must be in the participant's repertoire in some context, at some frequency or as a response to another external agency.

The issue of whether ‘self’ or ‘other’ is most effective in VBI for individuals with autism also has theoretical implications. According to observational learning theory, models who look more like the learner themselves are more likely to have the most impact (Bandura, 1969, 1977; Bellini & Akullian, 2007). Thus, observational learning theory would predict ‘self’ as model to be more effective than ‘other’ as model among VBI procedures. Finding out how this theory applies to individuals with autism may provide a greater understanding into how they perceive ‘others’ and ‘self’, and suggest whether or not impairments in ‘theory of mind’ (Charlop-Christy & Daneshvar, 2003) impacts upon their learning responses to these model types in comparison with typically developing individuals.

The reviews of Ayres and Langone (2005), Delano (2007a) and Mechling (2005) reported no difference between the relative effectiveness of ‘self’ or ‘other’ as model from their qualitative reviews of the literature. Similarly, Bellini and Akullian (2007) found no statistically significant differences between self-as-model (video self-modelling) or other-as-model (video modelling) regarding their intervention effects, maintenance, or generalization of target behaviours. This finding is exemplified by the study by Sherer et al. (2001), which was included in the reviews of Ayres and Langone (2005), Bellini and Akullian (2007), Delano (2007a), and Mechling (2005).

In the study of Sherer et al. (2001), a set of 20 questions was compiled for each of the five children, all diagnosed with autism. Eight questions were randomly assigned to the ‘self-as-model’ condition, another eight for the ‘other-as-model’ condition, and the remaining four questions were used as generalization probes. Two videotapes were created

for each child, one edited to show the participant themselves correctly responding (for the 'self-as-model' condition) and the other showing a typically developing peer correctly responding (for the 'other-as-model' condition). Three of the five participants achieved at levels of 100% accuracy at post-treatment. The main finding was that there was no empirical difference between the effectiveness of the 'self-as-model' (VSM) and 'other-as-model' (VM) conditions for enhancing the conversational skills of the participants. Sherer et al. (2001) hypothesised that using an adult or peer as model may be as effective for teaching functional skills but using the participant as their own model may be more effective for increasing their compliant behaviour. In line with this hypothesis of Sherer et al. (2001), several studies have reported that VSM procedures were effective in the reduction of problem behaviours (Buggey, 2005; Davis, 1979; Graetz, Mastropieri, & Scruggs, 2006; Kehle, Clark, Jenson, & Wampold, 1986; Lonckecker, Brady, McPherson, & Hawkins, 1994; Possell, Kehle, Mcloughlin, & Bray, 1999) and one study reported that a VSM intervention was effective in teaching classroom rules (Lang et al., 2009). Even so, the literature still lacks comparative studies of model types for the reduction of problem behaviours for participants diagnosed with autism.

McCoy and Hermansen (2007) acknowledged the lack of empirical data to support a definitive view regarding the relative effectiveness of 'self' and 'other' as model. Nevertheless, they proposed that self and peers seem to be the most effective models:

The verdict on who is the most appropriate and meaningful model for which type of behaviour is still out...Based on the literature in this review, at this time, the models with the most significant impact seem to be self and peers. (p. 206)

The review of McCoy and Hermansen (2007) was directed towards an evaluation of the type of model used in VBI. Though they did not include the study of Sherer et al. (2001) in the formal section of their review, they referred to its findings to contrast other studies, (such as McCurdy & Shapiro, 1988), where VSM procedures were considered to have been more effective than video peer-modelling procedures. The study of McCurdy and Shapiro (1988) did not involve individuals with an ASD and thus fell out of the inclusion criteria of McCoy and Hermansen's (2007) review.

In a more recent study, Marcus and Wilder (2009) found that VSM was more effective than VM (peer) for all three participants in teaching textual responses to novel letters. All three participants reached criterion in the VSM condition while only one participant reached criterion in the VM condition. Also, the participant who reached criterion in both conditions did so more quickly in the VSM condition. The authors acknowledge that having the participants emit the verbal response used in the VSM condition during video creation may have influenced their acquisition of the target behavior for this condition. Another study that compared VSM and VM was conducted by Cihak and Schrader (2008). Cihak and Schrader compared VSM and VM (adult model) for teaching adolescents with ASDs to perform vocational and prevocational skills. They reported that the VSM and VM procedures were equally effective overall, although two of the four participants reached criterion more efficiently in the VSM condition and one of the participants fractionating data paths also indicated a preference for VSM.

In light of the evidence that VM has been effective for a number of intervention studies, together with the suggestion that in some contexts VSM is more effective and/or

preferable to the participants, practitioners may find the approaches of Houlihan, Miltenberger, and Larson (1995) and Maione and Mirenda (2006) to be relevant. These studies involved using peer models initially, and during the VM phase the participant's own performance was recorded and presented via video as part of the independent variable in a subsequent phase. In the case of Houlihan, Miltenberger, and Larson (1995) the VM was effective alone, as was the VSM; while in the study of Maione and Mirenda (2006), the video feedback procedure (and prompting) was a pragmatic addition to the VM, which had a limited impact on the participant's performance of the target behaviours in isolation. These approaches minimise the difficulty of producing a video with the participant modelling behaviours that are not yet in their repertoire, while enhancing the intervention through the use of footage of the participants themselves.

In addition to the scarcity of studies comparing VM and VSM procedures, even fewer studies have compared the effectiveness of adults, peers and siblings as models (see also *Chapter 5*, page 139). Although each of the seven reviews reported on studies that successfully used these type of models, no comparative studies were identified that compared adults, peers, or siblings as models in the context of VBI for individuals with autism. For example, Gena et al. (2005) concluded that both an adult model and a peer model were effective in modifying the affective behaviour of preschoolers with autism who participated in their study, but the adult modelling was presented live rather than via video. Thus, further research is needed to identify whether one model type is more effective for certain target behaviours and to subsequently inform the design of VBI by parents, teachers and other practitioners.

2.8.3 What other aspects of the independent variable might promote intervention effectiveness?

While a range of procedural types and variations of VBI have been used for teaching individuals with disabilities such as autism, relatively unexplored aspects of these procedures represent unresolved questions for both practitioners and researchers. Such questions relate to: (1) the relative efficacy of the videos shown from ‘first-person’ and ‘third-person’ perspectives; (2) the use of other types of intervention in combination with VBI; and (3) the relative suitability of VM and VP procedures. Together with questions previously raised regarding the ability to predict whether or not an individual will benefit from VBI and whether one model type is more effective than others, the relationships between questions and the various procedural approaches can be mapped visually. Figure 2-1 presents a classification system for procedural types of VBI and notes key questions relevant to them. For example, prior to implementing a VBI, one could question whether this intervention approach will be suitable for the relevant individual.

2.8.3.1 Perspective of the video

The literature includes examples of studies that have used videos presented in the ‘third-person’ and the ‘first-person’ as part of successful interventions. Specifically, using videos shown from a first-person perspective (also referred to as ‘point-of-view’) have been found to be effective for teaching individuals with developmental disabilities how to prepare and mail a letter, care for a pet, set a table (Shipley-Benamou et al., 2002), use a microwave oven (Sigafos et al., 2005), social play (Hine & Wolery, 2006), wash dishes

(Sigafoos et al., 2007b). This perspective has also been used in the context of a video priming intervention to reduce disruptive transition behaviour (Schreibman et al., 2000). Footage showing only the hands of an adult from the participant's own perspective may be personalised by the participant to a greater extent than video footage showing the whole body of an adult model from a spectator's perspective. Therefore, using the first-person perspective may represent one strategy for maximising the effectiveness of peer or adult models if similarity between model to the predictions of observational theory in the effectiveness of 'self', 'peer' and 'adult' models. Ayres and Langone (2007) compared first-person and third-person perspectives with VM interventions to teach four students with autism to put away groceries. Neither condition was found to be superior to the other; the authors suggested that their relative effectiveness may simply be a matter of personal preference unless evidence from future research indicates otherwise.

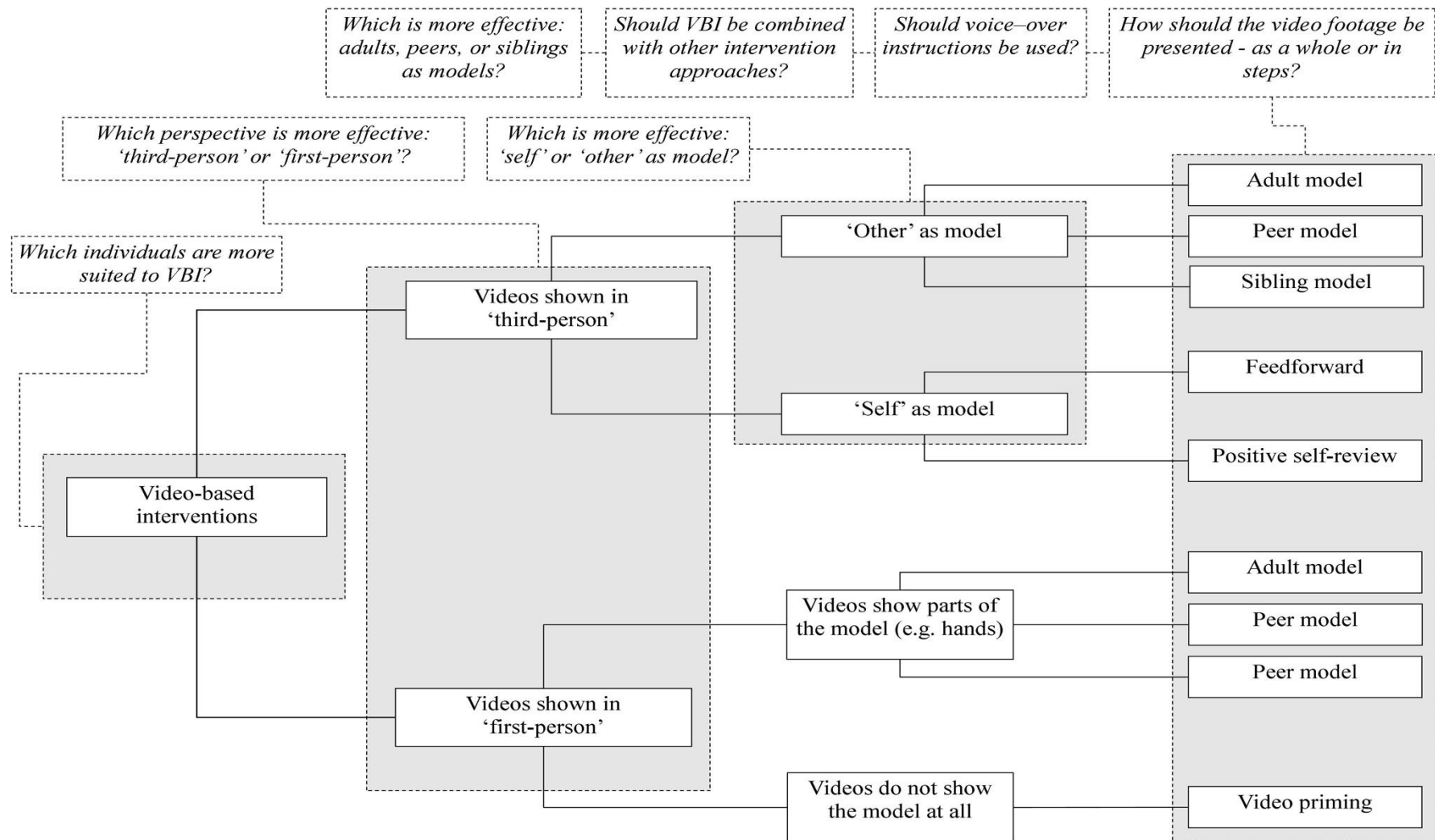


Figure 2-1. Questions relating to the different procedural types of video-based intervention for individuals with autism.

2.8.3.2 VBI in combination with other approaches

Even though some studies have shown VBI procedures to be effective in isolation (D'Ateno et al., 2003; McCoy & Hermansen, 2007; Reagon et al., 2006) and in comparison to other approaches (Charlop-Christy et al., 2000; Gena et al., 2005; Kroeger et al., 2007), there seems to be little clarity in the literature as to the usefulness of VBI in combination with other intervention approaches. Bellini and Akullian (2007) reported that VM and VSM have often been used with visual cueing and prompting, consequent strategies and self-monitoring techniques. They also noted that three of the four studies which evidenced the lowest intervention effects in their meta-analysis (Hagiwara & Myles, 1999; Ogletree et al., 1995; Thiemann & Goldstein, 2001) involved VBI in combination with other modalities.

In contrast, Ayres and Langone (2005), Delano (2007a), and Shukla-Mehta et al. (2010) reported on studies for which incorporating other approaches was necessary for the overall intervention success (such as Alcantara, 1994; Apple et al., 2005). Mechling (2005) expressed uncertainty as to whether VBI was best implemented in conjunction with other instructional methods or alone, and McCoy and Hermansen (2007) questioned the degree to which other interventions influenced the outcome of studies which used VBI in part of an intervention package. Kagohara (2010) also suggested that the frequency with which studies have utilised video-based instruction in combination with other procedures makes it difficult to reliably assess the effect of video-based instruction alone on participants' performances of the target behaviours.

2.8.3.3 *Voice-over instructions*

Following from the issue of intervention combinations is the question of whether voice-over instructions or narration have either hindered or enhanced VBI for individuals with autism. While studies have effectively used voice-over instructions and narration as part of their videos (Apple et al., 2005; McCoy & Hermansen, 2007; Sigafoos et al., 2005) the effectiveness of VBI for individuals with autism has been attributed to the ability to counteract stimulus over-selectivity and to the preference for processing visual stimuli of this population (Bellini & Akullian, 2007; Delano, 2007a; McCoy & Hermansen, 2007; Mechling, 2005). Thus, it may be that for some individuals incorporating voice-over instructions or narration together with the video footage may hinder the effectiveness of VBI. Again, research-based evidence provides little direct comparison between the inclusion and exclusion of verbal prompts, voice-overs, or narration as part of VBI interventions for individuals with developmental disabilities.

2.8.3.4 *Video prompting compared with video modelling*

Another procedural variation in VBI that has been investigated relates to whether the video is shown as a whole before participants performing the target behaviour (VM) or in a number of segments before giving participants an opportunity to perform isolated steps of the target behaviour (VP). VM may have the advantage of being quicker and easier to administer, but Cannella et al. (2006) reported that VP was more effective for teaching daily living skills in their study involving adults with developmental disabilities. For some individuals, presenting segments of the video and providing an opportunity to perform steps of the target behaviour

determined by a task analysis may be necessary to facilitate acquisition (Sigafoos et al., 2005; Tereshko, MacDonald, & Ahearn, 2010).

An investigation into a fading procedure of a VP intervention has been applied by Sigafoos et al. (2007b). This procedure essentially involved ‘chunking’ of segments of the video segments to include progressively more steps of the task analysis in order to promote maintenance and reduce prompt dependency; thus changing from a VP to a VM format with intermediate stages to accommodate the participants. The relationship between VP and VM procedures, the suitability of these procedures for different participants and target behaviours, and the use of procedures such as chunking for promoting maintenance of the target behaviour warrant further attention from future research.

2.9 Conclusion

This chapter has highlighted the efficacy of video-based intervention (VBI) for teaching individuals with disabilities such as autism. Intervention studies and reviews of the literature have reported that a range of procedural variations based on the use of video footage have produced positive intervention, maintenance and generalization effects for a range of different target behaviours. Notwithstanding, this review of the literature has emphasised that questions of theoretical and practical importance remain largely unanswered. These include questions such as: ‘Who would benefit from these procedures? What kind of model and perspective

should be used? What other procedures should be combined with the presentation of video footage? How should the video-footage be presented?’

Research focused on bringing answers to these and other questions raised in this chapter will serve to enhance the implementation of VBI - contributing to greater knowledge of educational interventions that are necessary to promote participation and quality of life for individuals with autism. It is within this context and with these questions in mind that the intervention studies described in this doctoral thesis have been designed, implemented and evaluated.

Chapter 3 - General Methodology

As stated in *Chapter 1*, the overarching aim of this doctoral research is to provide answers to the following two questions:

1. Can a measure of a participant's imitation ability be used to predict the suitability and the effectiveness of VBI of children with autism?
2. Which model types are more effective as part of VBI for children with autism: adults, peers, siblings, or the participant themselves?

The following section provides a context for the research approach used, the participants, and the ethical considerations that pertain to all three of the intervention studies conducted as part of this doctoral research aimed to address these questions.

3.1 A background to the research approach

3.1.1 Applied Behaviour Analysis

This doctoral research was designed within an applied behaviour analysis (ABA) research framework. Among the intervention approaches available, a number of researchers have found that procedures informed by the principles of ABA have been the most effective for promoting behavioural changes that enhance the quality of life for individuals with

developmental disabilities, such as autism (DeMyer, Hingtgen, & Jackson, 1981; Green et al., 2006a; Jacobson et al., 2005a; Keenan, 2006; Lovaas, 1987; Lovaas & Smith, 1989; Metz et al., 2005; Nikopoulos & Keenan, 2006; Rutter, 1985). According to the report of the Surgeon General on mental health issues in the United States (U.S. Department of Health and Human Services, 1999):

Thirty years of research demonstrated the efficacy of applied behavioural methods in reducing inappropriate behaviour and in increasing communication, learning, and appropriate social behaviour.
(p. 163)

The field of ABA has developed from the theoretical foundations of behaviourism (Cooper et al., 1987) (see Figure 3-1).

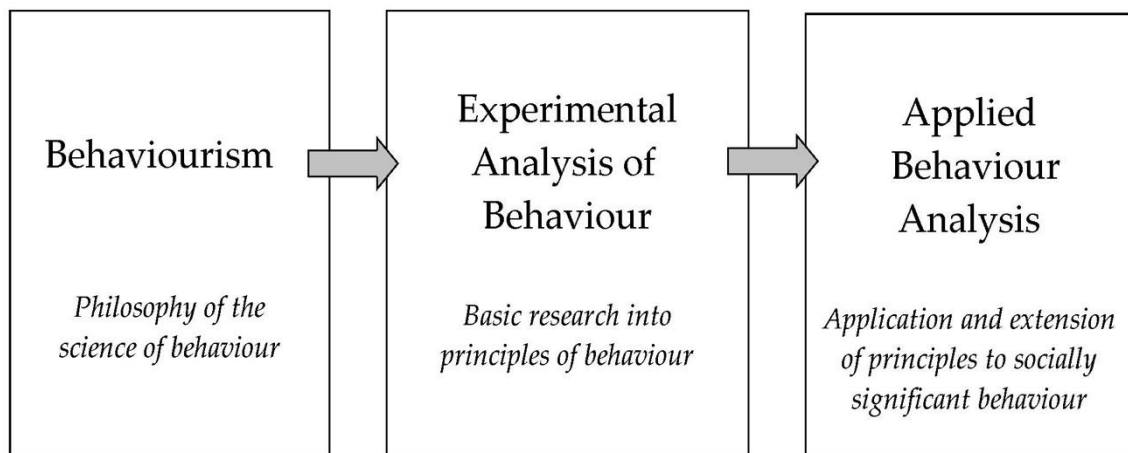


Figure 3-1. A diagram illustrating the conceptual development of ABA, modified from Table 1.1 in Cooper, Heward, and Heron, (1987, pp. 8-9).

Through books such as *The Behavior of Organisms* (1938), *Science and Human Behavior* (1953) and *Verbal Behavior* (1957), Skinner popularised behaviourist philosophy and argued for the experimental analysis of behaviour. A study conducted by Fuller (1949) also called for the principles of behaviourism to form the basis of interventions for people with severe disabilities. Fuller (1949) successfully conditioned the participant's right-arm movements using a sugar-milk solution as the reinforcing stimulus. Prior to this study being conducted, Fuller reported that the physicians who were caring for the participant did not think he had learned anything in his 18 years of life. Furthermore, there was little expectation that the participant had the capacity to learn anything in the future. Fuller's study showed that the participant could learn to perform this discrete behaviour, and also created an expectation that he could learn other behaviours as well.

Baer, Wolf, and Risley (1968) provided the initial, authoritative definition of ABA. Their definition can be summarised by seven keywords: (1) applied, (2) behavioural, (3) analytic, (4) technological, (5) conceptually systematic, (6) effective, and (7) generality. These words would be used as criteria to judge research in the field (Baer, Wolf, & Risley, 1987; Cooper et al., 1987). According to Baer, Wolf, and Risley (1968, 1987), a study within the ABA framework must demonstrate that it is applied to a socially significant target behaviour; behaviours that are important to the individual and/or society. The target behaviour chosen for the individual should be in need of improvement and be one which can be measured reliably. Inter-observer agreement (IOA) is an important measure of a

study's internal reliability within this methodological approach (Wilczynski, Christian, & National Autism Center, 2008). A study would be considered analytic when a functional relationship (not just a correlation) has been demonstrated between the target behaviour (dependent variable) and the environmental variable (independent variable) (Kennedy, 2005). The method needs to be precisely described to be considered 'technological', allowing for reliable replication of the procedures and ABA researchers should be conceptually systematic in relating the procedures for behaviour change with their underlying principles of behaviour (Baer et al., 1968, 1987). The behaviour change that is a function of the procedure should be socially significant - not just statistically significant - to be considered effective (Cooper et al., 1987). That is, the changes in behaviour should increase the individual's independence and/or quality of life. Furthermore, behaviour changes that continue after the intervention and appear in new environments or spreads to other positive behaviours have generality (Baer et al., 1968, 1987).

3.1.2 Single-case research designs

3.1.2.1 Rationale for the use of single-case designs

Within the paradigm of ABA, single-case research designs have become a prominent experimental approach (Bellini & Akullian, 2007; Cooper et al., 1987; Horner et al., 2005; Kennedy, 2005; Kratochwill & Levin, 1992). According to Horner et al. (2005), single-case

research designs are seen as a suitable design for studies involving students who need specialised educational programming because they:

“(1) focus on the individual; (2) allow detailed analysis of ‘non-responders’ as well as ‘responders’; (3) provide a practical methodology for testing educational and behavioural interventions; (4) provide a practical research methodology for assessing experimental effects under typical educational conditions; (5) allow the testing of conceptual theory; and (6) are a relatively cost-effective approach to identifying educational and behavioural interventions that are appropriate for large scale analysis.” (pp. 173-175)

Cooper, Heward, and Heron (1987) noted that group designs are often limited in behavioural research because they potentially hide the performance of individuals, risk the loss of detecting important sources of variability, and lose the power of replicating effects with individuals.

The majority of published studies investigating VBI for individuals with autism have used single-case research designs. As previously mentioned, only one of the 61 studies included in the seven reviews discussed in the previous chapter used a group design rather than a single-case research design (Kroeger et al., 2007); as did as only the study of Schunk and Hanson (1989) among those reviewed by Hitchcock et al. (2003). Because of their utility within this field, single-case research designs have also been considered the most suitable for the intervention studies described in this thesis.

Although single-case (also known as single-subject) designs frequently involve more than one participant, they are used to study functional relationships between an environmental (independent) variable and the target behaviour (dependent variable) on an individual basis, and are thus well suited to applied settings. In single-case designs, the participant serves as his/her own control. It is their internal validity that distinguishes single-case designs from case studies (Wacker, Berg, & Harding, 2008). Strategies for demonstrating experimental control in the single-case paradigm include the use of reversal designs, multiple baseline designs, and alternating treatments designs (Bellini & Akullian, 2007; Cooper et al., 1987).

3.1.2.2 Reversal designs

In reversal designs the dependent variable is measured within at least two experimental conditions which are alternated, and then the sequence is repeated at least once (for example: A-B-A-B, where A and B represent specific experimental conditions). Alternation of conditions allows experimental control to be demonstrated while using only one participant with one target behaviour. According to Cooper et al. (1987), the ABAB reversal design is the most straightforward and powerful single-case design for demonstrating a functional relationship between an independent and dependent variable. Because the effects of many independent variables persist after their withdrawal, this design is unsuitable for many intervention studies. Specifically, reversal designs are often incompatible for studying independent variables such as teaching, instruction, and

modelling where the intention is for the participant to maintain and generalise the performance of learned behaviours after the procedures are withdrawn - as is the case with the VBI studies described in this thesis.

3.1.2.3 Multiple baseline designs

In contrast to reversal designs, multiple baseline designs do not require the withdrawal of treatments that appear to be effective in order to show experimental control (Cooper et al., 1987). Two main phases are involved in multiple baseline designs: (1) baseline; and (2) intervention. The baseline phase includes the experimental sessions where data collection occurs in the absence of and prior to intervention. The intervention phase includes the experimental sessions where data collection occurs in the presence of the independent variable under investigation. By comparing the baseline and corresponding intervention phases, the effect of the independent variable can be evaluated. Multiple baseline designs often include a maintenance or 'follow up' phase, where data collection occurs in the absence of the intervention, following a specified time after the withdrawal of the intervention, such as in the study of Sigafoos and colleagues (2005).

In multiple baseline designs, a number of data paths across different participants, settings, or target behaviours are investigated. For each data path there are a different number of experimental sessions for the baseline phase (Cooper et al., 1987; Kennedy, 2005; Kratochwill & Levin, 1992). That is, the intervention is introduced at different times for each

data path. This allows each baseline phase to continue until stability is demonstrated in the data path, before which time it is generally unadvisable to proceed with an intervention phase (Cooper et al., 1987). Having different transition times from baseline to intervention allows changes to the dependent variable between these phases across different data paths to be described as a function of the intervention with greater levels of confidence (Cooper et al., 1987; Kennedy, 2005; Kratochwill & Levin, 1992).

A number of studies investigating VBI have used multiple baseline designs, including those across settings (Alcantara, 1994; Charlop & Milstein, 1989; Hagiwara & Myles, 1999; Taylor et al., 1999), target behaviours (Lasater & Brady, 1995; Norman et al., 2001; Ogletree et al., 1995; Shipley-Benamou et al., 2002; Thiemann & Goldstein, 2001), and participants (Charlop-Christy et al., 2000; Haring et al., 1987; Schreibman et al., 2000; Sherer et al., 2001; Simpson et al., 2004; Wert & Neisworth, 2003). Each of the three intervention studies conducted as part of this doctoral research utilised a multiple-baseline design. Study 1 and Study 2 used a multiple-baseline across target behaviours design while Study 3 used a multiple-baseline across participants design.

3.1.2.4 Alternating treatments designs

While multiple-baseline designs provide a strategy for demonstrating a functional relationship between one independent variable and one or more learned dependent variables, alternating-treatment designs have the capacity to evaluate the effectiveness of

two or more independent variables in the same single-case research study (Barlow & Hayes, 1979; Cooper et al., 1987; Kazdin & Hartmann, 1978; Kennedy, 2005; Kratochwill & Levin, 1992). When using this approach, two or more distinct independent variables are rapidly alternated with data being recorded for one target behaviour. Although a baseline phase is not essential for a basic implementation of the alternating treatments design, a common variation of the design involves: (1) a baseline phase; (2) alternating treatments; and (3) most effective treatment only (Cooper et al., 1987). Several studies have used alternating treatments designs to compare treatments involving VBI; such as comparing VM with VP (Cannella et al., 2006), comparing static picture prompting with VP (Cihak, Alberto, Taber-Doughty, & Gama, 2006) and comparing 'self' with 'other' as model (Sherer et al., 2001). The second and third intervention studies conducted as part of this doctoral research incorporated the alternating treatments design to evaluate the effect of different model types; Study 2 alternated adult-as-model and sibling-as-model, while Study 3 involved alternating adult-as-model and sibling-as-model for one participant and alternating adult-as-model and peer-as-model for the two other participants.

3.1.2.5 Inter -observer agreement

Inter-observer agreement (IOA) can be used to provide a measure for the internal reliability of data for studies with a single-case research design (Horner et al., 2005; Kennedy, 2005; Wilczynski et al., 2008). IOA involves having a second observer independently score the participant's performance in a percentage of the sessions of the

study. According to Cooper, Heward, and Heron (1987) the standard formula for expressing IOA as a percentage is:

$$\text{Percentage of agreement} = \text{points of agreement} / \text{number of items} \times 100$$

That is, the IOA represents the frequency at which two independent observers agree on each aspect of the participant's performance of the target behaviours. The above formula was used for measures of IOA regarding the participant's performance of the dependent variables in the three intervention studies. Also, the formula was used in order to provide an indication of the consistency and/or variability between sources ('observers') regarding each participant's imitative behaviours. IOA above 80% for at least 20% of sessions has been considered satisfactory in terms of supporting the internal reliability of the data and the data recording procedure (Kagohara, 2010).

3.1.2.6 *Procedural fidelity*

While IOA is used to evaluate the reliability of data in relation to the dependent variable, measures of procedural fidelity (or 'treatment integrity') evaluate the extent to which the independent variable is implemented as planned (Cooper et al., 1987; Kennedy, 2005). A checklist summarising the operational descriptions and definitions of conditions can be used by an observer (not the person implementing the intervention) to record whether the procedure was implemented as outlined consistently. A similar formula to that of IOA is used to calculate the percentage of procedural fidelity:

Percentage of procedural fidelity = points in the checklist implemented as planned /
total number of points in the checklist X 100

Within the Scientific Merit Rating Scale, procedural fidelity above 80% is considered acceptable (Wilczynski et al., 2008). Due to issues in the availability of personnel, procedural reliability data was not available for Study 1 or Study 3, and was collected in only two sessions in Study 2, which represents a limitation of these research studies described in the thesis.

3.1.2.7 Visual analysis of data

The primary method of data analysis to determine whether a functional relationship is demonstrated between an independent variable and a dependent variable for single-case research designs involves a visual analysis of the graphed data (Cooper et al., 1987; Horner et al., 2005). Although an intervention effect in single-case designs can be measured by statistical analyses and by calculating the percentage of non-overlapping data points (PND) across baseline and intervention phases (Scruggs & Mastropieri, 1998), these quantitative methods of analysis can mask the level, trend, and variability of data (Cooper et al., 1987). Visual analysis has been described as a conservative method of evaluating behavioural change – a change found to be significant by a statistical test of probability may look weak in a graphed representation of the data (Cooper et al., 1987).

Visual analysis also allows the data to be interrogated during the experimental phases of a study after each observation period, enabling the researcher to modify the independent variable where necessary (Cooper et al., 1987; Horner et al., 2005). The ability to evaluate the effect of the VBI (independent variable) upon the participant's observed behaviour (dependent variable) during the experimental phases, as well as upon completion, was important for the three studies undertaken as part of this doctoral research. Fading or modifying the intervention in response to the participant's responses over the sessions was necessary for each participant of the three VBI studies described in this thesis.

3.2 Assessment tools

3.2.1 *The Childhood Autism Rating Scale (CARS)*

Potential participants for inclusion in these studies were identified by having a formal diagnosis of Autistic Disorder (autism) made prior to the research and confirmed as part of the study by the researcher using the *Childhood Autism Rating Scale (CARS)* (Schopler, Reichler, DeVellis, & Daly, 1980). The CARS consists of 15 items scored from one to four, which provide overall scores in the range of 15 to 29.5 ('non-autistic'), 30 to 36.5 ('mild to moderate autism') and from 37 to 60 ('severe autism'). The CARS is a widely used, empirically validated and reliable assessment tool for identifying individuals with autism (Chlebowski, Green, Barton, & Fein, 2010; Mayes et al., 2009; Rellini, Tortolani, Trillo,

Carbone, & Montecchi, 2004). It is suitable for use by a range of professionals and can be informed by both observations and parent/guardian interview data, with overall agreement of 87% for the cutoff score of 30 with expert clinician classifications (Schopler, Reichler, & Renner, 1988). Furthermore, the CARS is the diagnostic tool of choice for inclusion on the Tasmanian Department of Education's (2010) register for students with severe disabilities. In summary, it was important that participants in this research have a confirmed diagnosis of autism and the CARS was chosen for this purpose because it is considered reliable and relevant to the context of this research.

3.2.2 The Vineland Adaptive Behaviour Scales (VABS)

A quantified description of the participants' levels of daily personal and social functioning (adaptive behaviour) was also conducted. Measures of adaptive behaviour assisted in determining suitable target behaviours for the participants, and permitted an exploration of the relationship between participants' level of adaptive behaviour and their response to VBI. Such data enables other practitioners and researchers to compare the characteristics of participants in the studies of this research project with potential and actual participants both locally and internationally. The *Vineland Adaptive Behaviour Scales* (VABS) (2005a, 2005b) were selected to provide these data.

The VABS survey forms enable a semi-structured interview with the respondent, such as a parent or caregiver. The possible responses include two for 'usually', one for

‘sometimes or partially’, zero for ‘never’ or DK for ‘don’t know’ to statements describing adaptive behaviour performance. The VABS covers the adaptive behaviour domains of communication, daily living skills, socialisation, and motor skills, as well as the optional maladaptive behaviour index. With the standardized norms based on a sample of over 3000 individuals, adaptive age equivalent information for participants can be calculated within each sub-domain based on V-Scale scores with confidence levels of up to 95% (Sparrow et al., 2005a). Since the first edition of the VABS (Sparrow, Balla, & Cicchetti, 1984), its reliability has led to its wide use for the diagnosis, assessment and monitoring for a range of clinical populations (American Association on Mental Retardation, 2002; American Educational Research Association, American Psychological Association, & National Council on Measurement in Education, 1999) and has been used to assess the adaptive behaviour profiles of individuals with autism (Villa et al., 2010).

3.2.3 The Imitation Disorders Evaluation (IDE) scale

Attention and imitation abilities are seen as prerequisite skills for effective VBI. There is, however, a lack of formal research investigating imitation as a prerequisite skill as well as the relationships between other participant characteristics and the effectiveness of VBI (Rayner et al., 2009). To study the relationship between imitation ability (as a prerequisite) and the effectiveness of VBI, this research assessed the participants’ imitation skills with procedures based on the *Imitation Disorders Evaluation (IDE)* scale of Malvy,

Barthelemy, Lenoir, Damie, Bodier, and Roux (1999). This brief clinical scale is a validated tool for evaluating imitation specifically for individuals with autism. The IDE procedure described by Malvy et al. (1999) includes an assessment of the child's imitation behaviours based on a 20 minute videotaped session. The session includes structured and non-structured imitation sequences primarily between the examiner and the child. Specifically, the videotape is examined for: (1) imitation of facial expressions; (2) visual pursuit; (3) imitation of gestures; (4) repeating sounds, words or sentences; (5) imitation with objects; (6) imitation of amusing actions; (7) the stereotypical nature of gesture imitations; (8) the frequency of echolalia language; and (9) the variability of imitation.

The IDE scale has been described as 'validated' by Receveur et al. (2005) and 'potentially very useful' by Loddo (2003). Smith, Lowe-Pearce, and Nichols (2006) noted that the scale has strong internal validity, on the basis that performance on the IDE differentiated typical children and children with autism, and that following nine months of treatment, children with autism increased their IDE scale scores. Furthermore, they noted that the retrospective study of Receveur et al. (2005) reported good reliability for the IDE ratings (Smith et al., 2006), which is consistent with the statistics for inter-rater reliability and factor analysis for content validity reported by Malvy et al. (1999).

In critique of the IDE, Smith et al. (2006) suggested that one weakness in the scale is the absence of standardisation and comparative normative information provided. This absence is noted for other imitation assessment scales, such as the scales of Stone, Ousley,

and Littleford (1997) as well as those of Beadle-Brown (2004) (Smith et al., 2006). The *Multidimensional Imitation Assessment* (MIA) proposed by Smith et al. (2006) to address this issue was not yet developed prior to the commencement of this research. Furthermore, the IDE involves a broader evaluation of imitation than does the *Motor Imitation Scale* (Stone et al., 1997) as used by Hine and Wolery (2006), which focused only on imitation of body movements and imitation with objects.

It was therefore proposed that an assessment procedure based on the IDE scale of Malvy et al. (1999) would represent a suitable means to evaluate the imitation abilities of children with autism. Based on the theory that imitation ability is a prerequisite for effective VBI, the IDE may be a useful tool for predicting the suitability of VBI for specific individuals with autism. That is, it is hypothesised that the children who demonstrate higher imitation abilities are more likely to respond to VBI with more rapid acquisition and/or with more positive alteration of the target behaviour than those who demonstrate lower imitation abilities.

3.3 Participants

3.3.1 Inclusion criteria for participants

There were three inclusion criteria for participants involved in the studies described in this thesis:

1. Participants were children of compulsory schooling age (5 years to 16 years old);
2. Guardians/parents as well the relevant school principal and teacher provided informed consent for the participant's involvement;
3. Participants had already been formally diagnosed with autism prior to the study, with the diagnosis confirmed by a score of 30 or above on the CARS (Schopler et al., 1980) through an independent assessment conducted by the researcher.

This research was intended to have direct applications to educational practices and programs for individuals with autism in school contexts. As well as providing guidelines for the setting of the interventions, this intention set an upper and lower limit to the age range of the sample. The rationale for limiting the studies to children of schooling age was for theoretical and practical reasons. First, it is often difficult to confirm diagnoses of autism during infancy (American Psychiatric Association, 2000). Second, the VBI procedures described here may not have been suitable for very young children, as these participants may not have possessed the attention and imitative abilities that have been considered as prerequisites for this type of intervention (Buggey, 2005, 2008; Sigafoos et al., 2007c). Furthermore, liaising with schools had some practical advantages. For example, the schools helped to identify suitable participants, provided space for the intervention phases of the research, and acted as a third party for participants and their parents/guardians.

It was central to the aims of this thesis that all participants were diagnosed with 'autistic disorder' as described by the American Psychiatric Association's (2000) *Diagnostic and Statistical Manual of Mental Disorders*. Autism is a pervasive developmental disorder

characterised by severe impairment in several areas of development and in most cases is associated with mild to severe intellectual disability (American Psychiatric Association, 2000). As Kanner (1943) also observed, special cognitive skills are sometimes evident, such as decoding texts and making calculations (American Psychiatric Association, 2000; Sigafos et al., 2007c). Autism is conceptually related to the diagnoses of Asperger's syndrome and pervasive developmental disorder – not otherwise specified (PDD-NOS), which comprise what are termed 'autism spectrum disorders' (American Psychiatric Association, 2000; Bellini & Akullian, 2007). Autism is a neurologically based developmental disability, and typically follows a continuous course which is evident after 2 years of age (American Psychiatric Association, 2000; British Columbia Ministry of Education, 2000; Sigafos et al., 2007c).

Because the aims of this research were not directed towards a specific category of target behaviour (such as communication, social interaction, or daily living skills), the selection of the target behaviours was pragmatic in nature and participants were not required to have any specific aspect of behaviour identified as a priority for intervention or treatment to be included in these intervention studies. In line with the principles of ABA (Baer et al., 1968, 1987), the procedure for choosing target behaviours involved was informed consultation with parents and school staff to identify socially important skills or behaviours they would like the participant to learn, and then confirming that the participant

did not fully demonstrate independence or mastery of the skill in the baseline phase of the study.

3.3.2 The recruitment process

The source of potential participants included schools which catered specifically for students with developmental disabilities as well as regular schools. This represented schools under the jurisdiction of the Department of Education as well as privately operated schools. One school that catered specifically for students with developmental disabilities was contacted directly. Subsequently, an appointment was made with the school principal where the nature of the research was discussed briefly in person. For further recruitment, an advertisement (see Appendix I) was included in the Department of Education's 'Infostream' bulletin (Department of Education Tasmania, 2009)

When a member of a school's staff or a parent/guardian contacted the researcher to express an interest in the studies on behalf of his/her student or child, they were sent copies of an informed consent form which gave details about the research and provided an opportunity to formalise their desire to have the student/child participate on a voluntary basis. The principal sent copies of a similar informed consent form to the parents/guardians of the potential participating students, as well as to the students' classroom teachers. The participants themselves were unable to give informed consent because of their age and in some cases because they had severe cognitive disabilities. For this reason, the researcher

invited the parents/guardians of the participant to give advice on how to inform the individual participant about the nature of the research and to provide an opportunity for them to volunteer and withdraw their participation at any stage of the research, in a way that best suited their individual needs. With the parent's/guardian's permission, the child's school principal and teacher also contributed this advice.

School representatives and parents/guardians who were interested in the project were able to contact the researcher for further information, and those who were willing to allow their child to participate in the study returned the signed consent form to the school principal in a stamped envelope that was provided. The researcher did not have access to parent/guardian's addresses at any time, nor did he have access to their names or any other personal details until after the parents had returned the signed consent form. When consent forms were returned, the principal informed the researcher which students could participate in the study. A similar process was followed to identify and recruit peers or siblings who could act as models in the videos presented to the participants. The nature of the study was discussed individually with peers and siblings who acted as models, in a way that was appropriate to their age and understanding, prior to their involvement. These discussions emphasised the voluntary nature of their participation and the steps they should take if they wished to withdraw at any time.

A sample size of between three and nine children with autism across the three studies was considered suitable to ensure the feasibility of this doctoral research, as well as

to allow meaningful findings to be gained for two main reasons. First, for useful descriptive information to be obtained about the IDE scale scores (Malvy et al., 1999) as a predictive tool for the suitability of participants for VBI, it was important that there were several participants involved to permit at least an informal comparison of imitation scores and VBI effects. Second, while useful findings can be drawn from several single-case studies involving only one participant (Horner et al., 2005), involving a large number of participants would be unmanageable for this research project which used single-case research designs.

3.3.3 Ethical considerations

Because of the variability of the individual needs of participants, the target behaviours for the studies were chosen through consultation with relevant school staff and the parents of the participants. While the researcher provided some parameters for what would be feasible within the scope of the research, parents had the final decision in approving the selection of target behaviours.

The data collected during the study initially corresponded to the first name of the participants, in order to ensure the reliability of the methodology. This first name and the corresponding data collected were only available to the researcher, supervisors and colleagues involved with data collection as observers. The discs and digital-storage devices with the video-recorded sessions for completion of the IDE scale were kept in a locked

cabinet during the period of time while scoring was being completed and IOA had been evaluated. Password locked computers were used to store and view the video-files during completion of the evaluation (data collection) and were only available to those involved in analysing the sessions. After the data collection and scoring was completed, the video files were kept in a locked filing cabinet at the University, as with the rest of the data from the research, where they will remain for five years prior to destruction.

Pseudonyms have been used in this research for participants with one exception. The participant in the first intervention study (described in *Chapter 4*) has been described by using his real first name: 'Regan'. This was because his parents requested, in writing, that his real name be used in any publications or reports arising from the study.

There were no foreseeable potential physical, psychological, social, legal, or other risks to the participants as a result of participating in these studies. Standard educational procedures and non-invasive assistive technology were used throughout. Similar procedures and technologies have been used in other studies using VBI for children without any adverse effects being reported. Indeed, similar intervention approaches have been considered non-invasive as well as being socially valid (Ayres & Langone, 2005; Bellini & Akullian, 2007; Delano, 2007a; Hitchcock et al., 2003; McCoy & Hermansen, 2007; Mechling, 2005; Nikopoulos & Keenan, 2006; Sigafos et al., 2007c). Nevertheless, support staff, teachers and counsellors remained available for all participants and parent/guardians throughout the process of the project. Also, the parent/guardians of the participant were

free to withdraw their child from the project at any stage by notifying a third party, namely the school principal.

Feedback about the results of the research was shared with the participants' parents/guardians, and with their permission, the results were also shared with the principal of the participants' school and the person in charge of their educational program. An overview of each participant's diagnostic information and response to the interventions were discussed orally with the principal of the participants' school and/or the person in charge of the student's educational program. It was deemed reasonable and beneficial to discuss generic information regarding the participant's involvement in the research that could contribute to or enhance their educational programming. School staff did not have access to the pseudonyms of participating students, nor did they have access to the actual data for any participants relating to any phase of the research. All general reports, as well as any papers generated from work completed during this research have also been provided to the participants' parents/guardians and to the principal of the participants' school with the parents'/guardians' permission.

Formal ethics approval was received from the Human Research Ethics Committee (Tasmania) Network (reference H10238) as well as the Department of Education. A copy of the ethics applications and notification of approval have been included as appendices of this thesis (see Appendix A and Appendix B).

Chapter 4 - Study 1: Video Modelling to Improve Task Completion in a Child with Autism

4.1 Overview

Video modelling (VM) was used to teach a 12 year-old boy diagnosed with autism two daily living skills: unpacking his school bag (back pack) and brushing his teeth. Despite being associated with obsessive and restricted patterns of behaviour, the intervention led to a rapid increase in the percentage of steps performed in the unpacking sequence, and these gains generalised to the packing of his school bag sequence prior to departure from school. While the participant demonstrated greater independence in the tooth brushing routine with the VM intervention, the intervention had little effect on the actual brushing action steps. This study demonstrated a novel approach for identifying the potential of video-based interventions with particular individuals. It extends the literature regarding the nature of target behaviours for which VM can be of benefit, and illustrates some variables which can limit the effectiveness of VM interventions.

4.2 Introduction

In recent years, forms of video-based intervention (VBI) have demonstrated particular efficacy for teaching individuals with autism a range of adaptive behaviours (Bellini & Akullian, 2007; Darden-Brunson et al., 2008). VBI has been used to teach

communication, social, daily living, and academic behaviours as well as increase the frequency of appropriate and compliant behaviours (Ayres & Langone, 2005; Bellini & Akullian, 2007; Delano, 2007a; McCoy & Hermansen, 2007; Mechling, 2005). VBI capitalise on the relative strengths in visual processing skills individuals with autism often possess (Nikopoulos & Keenan, 2006) and enhance stimulus control (Sturmey, 2003). Nevertheless, a number of key issues surrounding the use of video-footage as an independent variable require further exploration (Rayner et al., 2009).

With theoretical foundations in observational learning (Ayres & Langone, 2005; Bellini & Akullian, 2007), it has been suggested that imitation and attention skills represent critical prerequisites for enabling successful VBI such as VM (McCoy & Hermansen, 2007). Thus, assessing imitation and attention skills would seem to be a logical step in determining the suitability of individual participants to these forms of intervention (Rayner et al., 2009). As a prerequisite for inclusion in their studies, Nikopoulos and Keenan (2003) tested participants' ability to attend to a TV screen for one minute. Training in the form of verbal instruction and modelling with verbal and tangible reinforcement was provided in order for participants to meet this requirement prior to baseline and intervention phases. Also, Hine and Wolery (2006) included an assessment of motor imitation ability which was included as part of the demographic information of the participants. In order to improve practitioners' ability to predict the effectiveness of VM for specific individuals, further exploration of

general methods to measure and report empirically on imitation and attention skills has been warranted (Rayner et al., 2009).

While possessing imitation and attention skills are believed to enable an individual to benefit from VM and other VBI, problem behaviours can act as a limiting factor for the effectiveness of VBI that focuses on communicative, social and functional target behaviours (Nikopoulos, Canavan, & Nikopoulou-Smyrni, 2009; Nikopoulos & Keenan, 2003). Mixed results have been obtained from studies using VBI to target the reduction of problem behaviours directly. Bugey (2005) found video self-modelling to be effective for reducing tantrums and pushing behaviours. Similarly, Coyle and Cole (2004) reported that video self-modelling and self monitoring were effective for reducing off-task behaviour for children with autism. In contrast, the multimedia social story intervention of Hagiwara and Myles (1999) did not clearly demonstrate positive intervention effects for the on-task behaviours of their participant. Studies by McCurdy and Shapiro (1988) and Clark, Beck, Sloane, and Goldsmith (1993), involved participants without an autism spectrum disorder, also failed to produce reductions in inappropriate classroom behaviour and aggression, and non-compliant behaviour respectively. The reinforcement histories of participants were proposed to explain the limited intervention success in these two studies.

In a study investigating video priming, Schreibman et al. (2000) demonstrated that the presentation of video footage of specific locations could be used to reduce problem behaviours associated with the transitions to these locations, for the three participating

children with autism. The intervention effects were also reported to have generalised to transitions to other settings not depicted in the videos. It was suggested that the reduction in disruptive behaviour was the result of the video footage making the change in environment more predictable (Schreibman et al., 2000). Schreibman et al. (2000) provided a positive example of the utility of VBI in addressing the lack of behavioural flexibility, which is characteristic of autism spectrum disorders (Green et al., 2006b). The insistence on sameness and resistance to change that typifies individuals autism often limits their opportunities for social participation and hinders their engagement in potentially beneficial intervention programs (Green et al., 2007).

More recently, Nikopoulos et al. (2009) used a VM procedure to establish instructional stimulus control over a behaviour that required the participant to terminate the social play activity they were engaged in at the time. The intervention rapidly led to reductions in latency to the verbal request 'play is finished' by the three participants, who all had a diagnosis of autism and were noted for engaging in set patterns of behaviour, non-functional routines or stereotyped behaviours. The studies of Schreibman et al. (2000) and Nikopoulos et al. (2009) represent important advances in applying an effective intervention modality, video, to address symptoms of a core deficit of autism - behavioural flexibility.

The study reported in this chapter aimed to further explore the relationship between imitation ability and the effectiveness of VM by incorporating an interview-based and an observed video-based imitation assessment, both informed by the IDE scale of Malvy et al.

(1999) prior to intervention. This study explored the efficacy of VBI to teach a functional skill characterised by a history of non-compliance as well as obsessive, rigid and repetitive patterns of behaviour on the part of the participant. Tooth brushing, a behaviour not associated with such a history for the participant, was also targeted for intervention in this study.

4.3 Method

4.3.1 Participant

Regan had been diagnosed with autism at age two and was 12 years of age at the time of the study. He attended a school which catered specifically for students with multiple and/or severe disabilities. Regan appeared to have a strong visual memory in that he could complete complex pattern puzzles and typed phrases he had seen on CD and DVD covers accurately into word processing documents on a computer. While he could comprehend some speech of others, he seldom demonstrated functional verbal language in the form of words or sentences. Regan's behaviour was characterised by obsessive, rigid and repetitive behaviours which hindered his participation in functional routines at home and at school. Regan's real name has been used in this chapter in response to the written request of his parents.

Through observations and an interview with Regan's parents prior to the study, Regan scored 38.5 on the *Childhood Autism Rating Scale* (CARS) (Schopler et al., 1988), which placed him in the 'severely autistic' range. Within the CARS assessment, Regan's behaviour matched the description for the highest available score (four) regarding problems with adaptation to change. His scores on the *Vineland Adaptive Behaviour Scales* (VABS) (Sparrow et al., 2005b), by way of interview with his parents, were within one standard deviation of the mean for non-verbal autism for the sub-domains of receptive, expressive and written communication, as well as for community (daily living skills) and interpersonal relationships. Regan was one standard deviation below the mean for non-verbal autism for the play and leisure skills and coping skills sub-domains, more than one standard deviation below this mean for domestic daily living skills, and more than one standard deviation above this mean for gross and fine motor skills. Based on these VABS scores, Regan's adaptive behaviour age equivalent was approximately two years and nine months (see Figure 4-1 and Table 4-1).

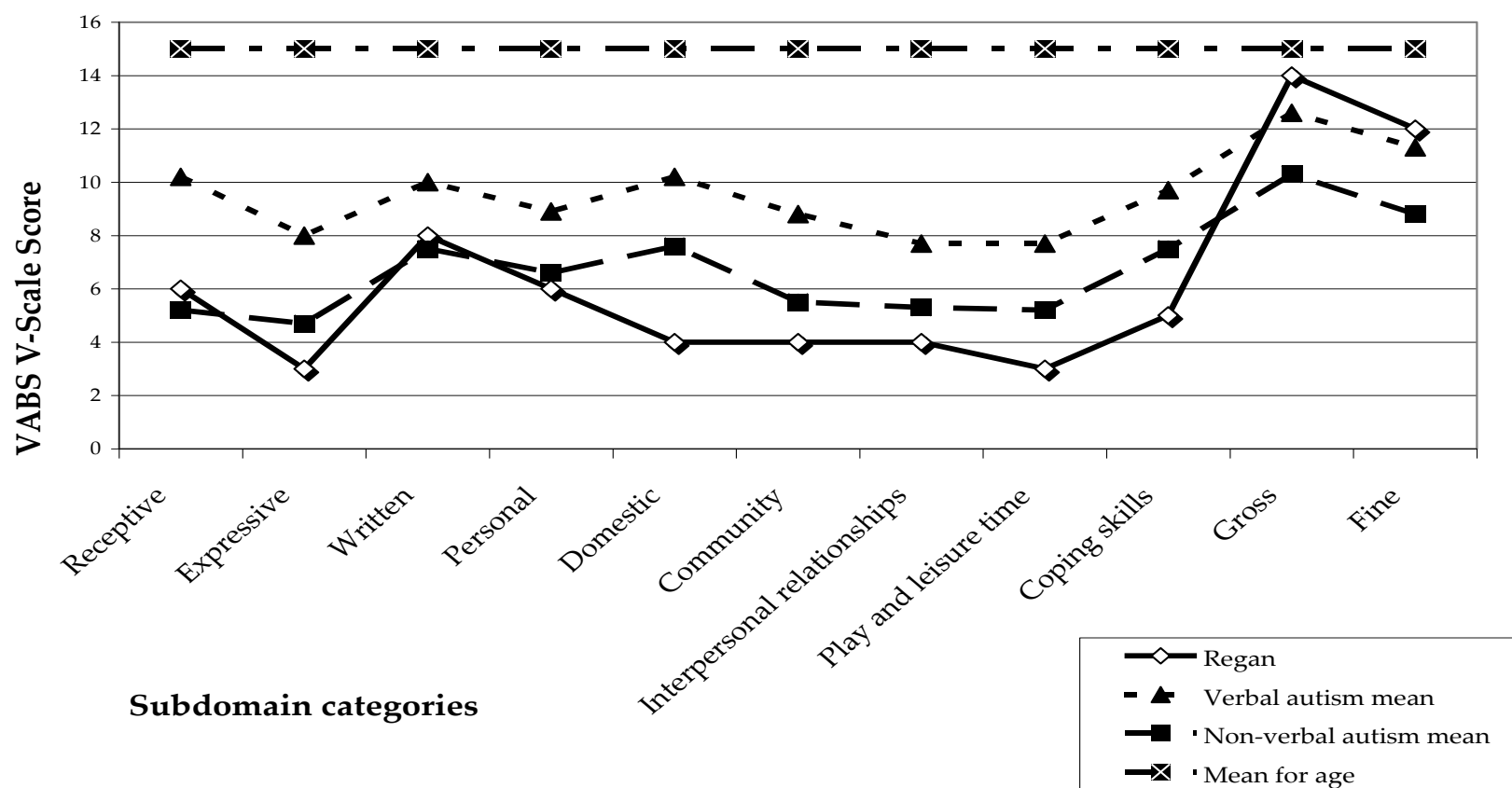


Figure 4-1. Graph showing Regan's VABS V-Scale scores in comparison to the means for individuals with verbal autism and non-verbal autism, as well as typically developing individuals at the same chronological age (Sparrow et al., 2005a).

Table 4-1. Summary of Regan’s adaptive behaviour according to a VABS assessment.

Domain	Sub-domain	Age equivalent (years : months)
<i>Communication</i>	Receptive	1:10
	Expressive	1:4
	Written	6:6
<i>Daily Living Skills</i>	Personal	0:7
	Domestic	1:2
	Community	2:5
<i>Socialisation</i>	Interpersonal relationships	0:11
	Play and leisure time	1:1
	Coping skills	0:10
<i>Motor Skills</i>	Gross	5:11
	Fine	5:8
Overall average		2:9

4.3.2 Setting

The video-based imitation assessment session, as well as baseline, intervention, generalisation and follow-up sessions for both target behaviours were all conducted within Regan’s regular classroom. This classroom was managed by one teacher on Monday, Thursday and Friday, and another teacher on Tuesday and Wednesday. Each day the teachers were supported by up to five teacher aides, depending on student

attendance on the day. Regan shared the classroom with up to nine peers who had a variety of diagnoses, including several peers with dual-enrolments who also spent time in mainstream schools. During the majority of the study, Regan stayed at respite accommodation on Wednesday and Thursday nights and lived at home on all other nights. Thus, on Monday, Tuesday and Wednesday Regan would travel to school from home in the family car, while on Thursday and Friday mornings, he would travel from his respite accommodation on a bus. After session 14, Regan only stayed at his respite accommodation on Thursday nights.

4.3.3 Pre-baseline anecdotal observations regarding the target behaviours

Regan's obsessive and rigid adherence to his own routines together with his resistance to being involved in more functional daily living and academic routines was a concern to his parents and his teachers. Preparing for the transition from home to school was noted to be particularly difficult and unreasonably time consuming for his parents. Throughout the previous year and during the current year in which Regan had been part of his current classroom, he had performed a rigid routine upon arrival at school. He would walk or run around the classroom and frequently sought opportunities to escape outside or into the corridor. He would react to anyone approaching him or attempting to remove his school backpack for him by pushing them away. Then, at some point after repeated requests, he would take off his school bag (and harness when

travelling to school by bus) and put it on the floor. He would then take his shoes and socks off and arrange them, as well as his school bag (and harness), in a pattern that was repeated each school day (see Figure 4-2).



Figure 4-2. Regan's arrangement of his socks, shoes, bag and harness on the floor of his classroom.

Regan would physically prevent anyone from touching the items in this arrangement for a period of time, until he had become willing to proceed to another activity. If any disruption to this ritual occurred, the ritual would be repeated. Regan would not unpack his school bag which contained the communication book, lunch box, or drink bottle – this was despite instructions and prompting provided by teaching staff, as well as the opportunities for observing his peers performing this task. This was eventually done by the teacher or a teacher aide. According to his classroom teachers, this morning routine would sometimes take up to 40 minutes. Not only did this rigid

routine impede Regan from participating in his planned learning experiences, it also represented a basic daily skill in which he had not demonstrated independence. The school guidelines for students' unpacking their school bags upon arrival encouraged independence, but did not insist upon compliance, in case such pressure triggered a negative start to the day.

According to his teachers, Regan also did not demonstrate independence in packing his school bag prior to getting on the bus at the end of the day, and this routine was also restricted by a rigid and obsessive pattern of behaviours. The bus had to arrive before he would put on his socks and shoes, and only then would he comply to put on his harness and his bag (with assistance from teaching staff). While the afternoon packing of the bag sequence did not take as long as the morning routine, Regan did not get his bag, nor collect and pack away his communication book. (His lunch box and drink bottles were normally put into his bag after lunch time, thus he would not need to perform these tasks at the end of the day.) The sequence of unpacking his school bag became one of two daily living skills targeted for intervention in the present study, with the afternoon packing of the school bag sequence used as a generalisation measure.

Tooth brushing, the second target behaviour was introduced into the daily timetable each afternoon in Regan's classroom as part of this study. His parents had apparently to teach him to brush his teeth in the past with limited success, as Regan would simply chew on the tooth brush, presumably for the sensory reinforcement.

Regan also had a history of inappropriate uses of water and other liquids. Nevertheless, his parents and teaching staff considered that Regan possessed the necessary fine motor coordination to perform these behaviours, and this was supported by his relative strengths in the gross and fine motor skills VABS sub-domains (see Table 4-1 and Figure 4-1).

4.3.4 Imitation assessment

Prior to baseline and intervention for the target behaviours, Regan's imitation behaviour was assessed in two ways (see Appendix C and Appendix D), both of which were informed by the IDE scale (Malvy et al., 1999). The first approach involved interviewing Regan's parents, his teachers, and a teacher aide who was well acquainted with him about his imitative behaviour. In these three separate interviews, the respondents were asked nine questions (each corresponding to an item of the IDE), such as 'Does Regan imitate facial expressions such as smiling, grimacing and putting out his tongue that you or others are displaying?' Options for responses included 'Never', 'Sometimes', 'Often', 'Very Often', or 'Always'; representing an estimated zero, one, two to three, four, or five imitations for every five opportunities respectively. Associating these terms (such as 'Very Often') with a corresponding number (such as four times out of five opportunities) allowed the interview respondents to draw on their experiences to predict Regan's responses to imitative opportunities. This allowed a comparison

between scores from the interview-based (predicted) and video-based (observed) assessment formats.

Following the interview-based imitation assessments, a video-based assessment imitation was also conducted. Because one of the study's aims was provide an exploration of imitation assessment in relation to VBI, the imitation sequences included in this assessment were delivered via video, displayed on a laptop computer. The videos were recorded using a Panasonic SDR-H250 digital video camera and edited using the widely available Windows Movie Maker program software on a Dell Latitude D620 laptop computer. The resulting video consisted of two sets of five opportunities (labelled 'Video set 1' and 'Video set 2' in Figure 4-4, Figure 4-5, Table 4-2) for the participant to demonstrate imitation and visual pursuit behaviours, which relate to the first six items of the IDE. The video featured only the researcher, who was unfamiliar to the student prior to the commencement of the study. Still images from the video used in the video-based imitation assessment are presented in Figure 4-3.

Brief written and verbal instructions were provided as an introduction to the video, which was 9 minutes and 57 seconds of duration in total. The video was presented using Windows Media Player. If the participant stopped looking at the computer screen, the researcher paused the video and prompted him to attend by saying, 'Okay Regan, watch this' or words to similar effect, before resuming the video. The number of appropriate imitations was recorded during the session. Because the

session was video recorded, Regan's behaviour in relation to the IDE items seven to nine was assessed by watching the video after the session was completed. In order to provide a measure of inter-reliability for the video-based imitation assessment, a colleague assessed Regan's performance in the video-recorded session. In order to evaluate the consistency of the measure across observers and sources, the percentage of agreement between the video-based imitation assessment and all respondents in the interview-based imitation assessments was calculated using the formula:

$$\text{Percentage of agreement} = \text{points of agreement} / \text{number of items} \times 100$$

In recognition of the potentially more subjective nature of the interview-based (predicted) assessment of Regan's imitative behaviour, data for agreement between the sources (parent, teacher, teacher aide, video-based observations) within one level of the scale are reported in Table 4-2. For example, if the teacher responded to one of the interview-based assessment questions with 'Always' (five out of five opportunities), the score in video set 1 would have to be either four or five out of the five opportunities to constitute an agreement within one level of the scale. Data indicating agreement within one level would permit an evaluation of the general consistency of imitation assessment sources. Data for exact agreement between the researcher and a colleague (inter-observer agreement [IOA]) is reported for the video-based (observed) assessment, as these observations were of the same session, which included both video set 1 and video set 2; measures of exact agreement were used for all IOA data in this research.

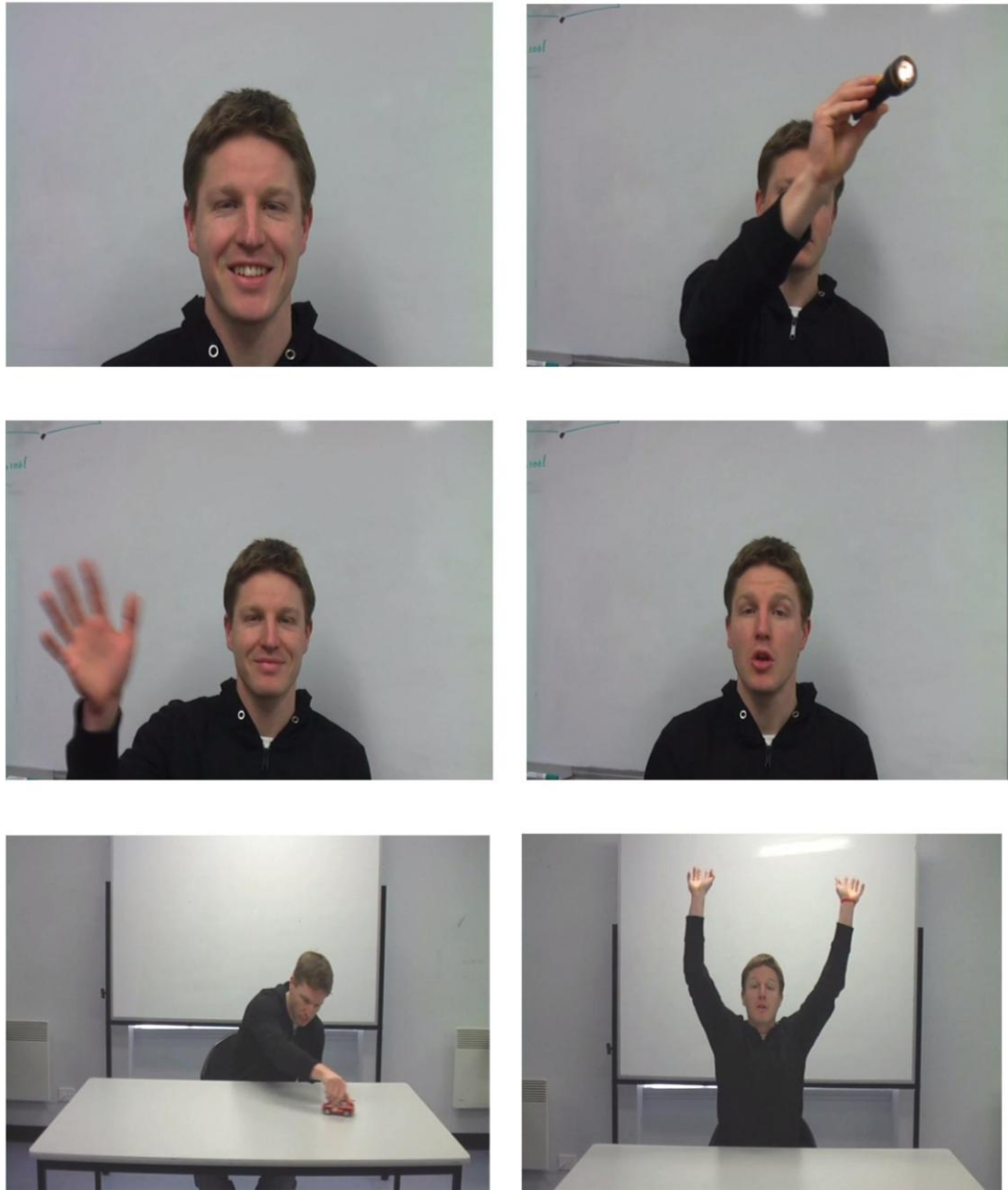


Figure 4-3. Still images from the video used in the imitation assessment, corresponding to items 1 (top left), 2 (top right), 3 (middle left), 4 (middle right), 5 (bottom left), and 6 (bottom right) of the *Imitation Disorders Evaluation Scale* of Malvy et al. (1999).

Regan showed strengths in visual pursuit. His parents, teachers, and the teacher aide reported that he would always follow people or objects with his eyes. This strength was evident in the video-based assessment with five performances of visual pursuit from the first set of five opportunities, and four from the second set of performances. Consistent with his adaptive behaviour profile, Regan demonstrated only one correct imitation of a single syllable word/sound in the observation in the first and second set of five opportunities in the observation-based assessment. Regan did not perform any echolalia during this assessment session, neither was he reported to engage in this behaviour by his parents, teachers and a teacher aide by way of the interviews.

While the data highlighted some strengths and weakness of Regan's imitation behaviour, the results varied across the interview respondents and the observation based assessment session. The first set of opportunities for each of the first six IDE scale items in the video-based assessment as well as the interview with the teacher aide provided the highest scores for Regan's imitative behaviours, with 20 out of a possible 30 correct imitations. The lowest scores from the first six items were recorded by interview with the teachers (12), followed by the second set of opportunities in the observation-based assessment (14) and the parent interview (15), as illustrated in Figures 4-4 and 4-5. Both Regan's parents and teaching staff who were interviewed indicated that they had difficulty interpreting and responding to questions related to items 7, 8 and 9 of the IDE scale.

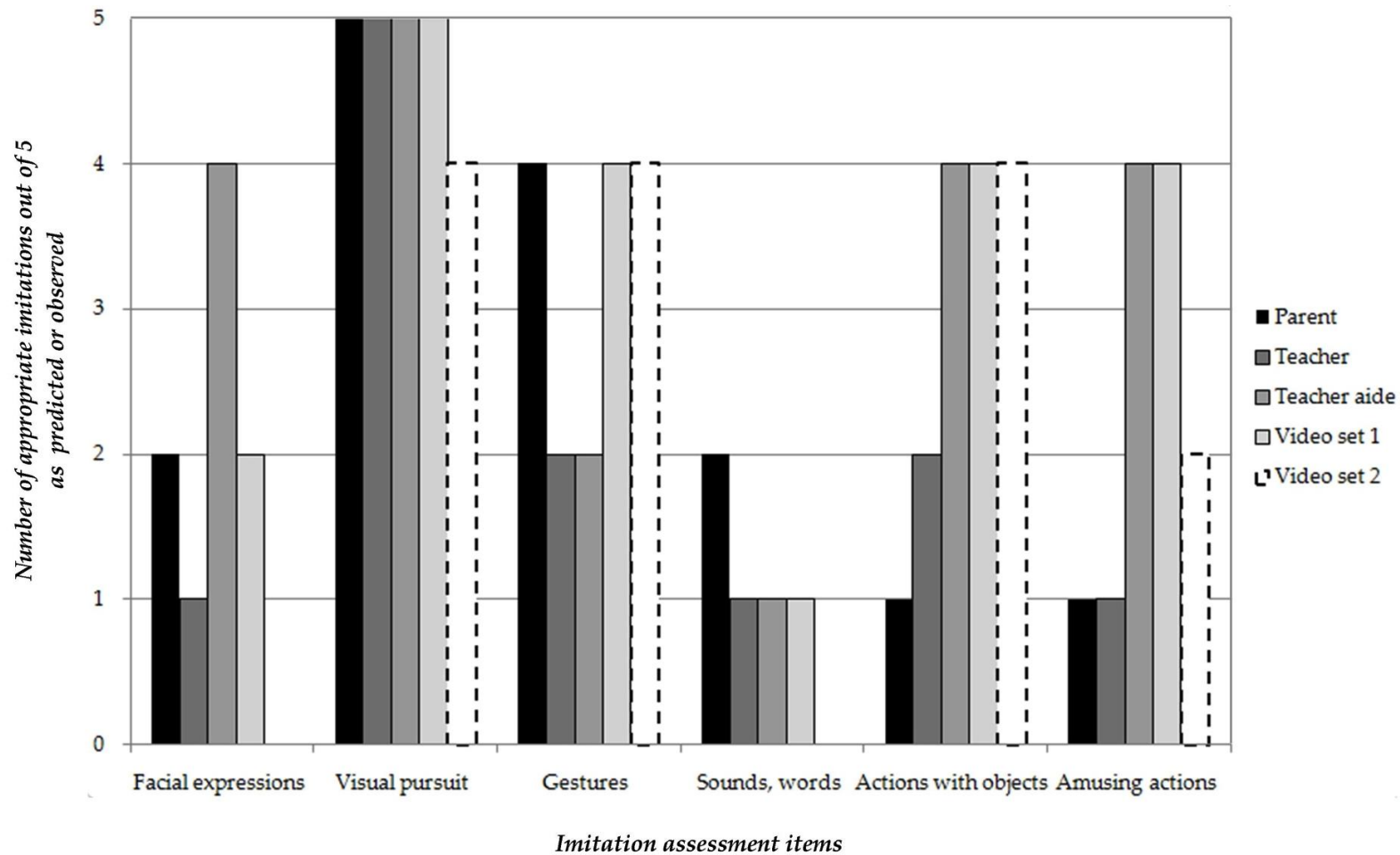


Figure 4-4. Regan's predicted (interview-based) and observed (video-based) imitation assessment scores for items 1-6 from the Imitation Disorders Evaluation (IDE) of Malvy et al. (1999). 'Parent', 'Teacher', and 'Teacher aide' assessments were interview-based (predicted performance). 'Video set 1' and 'Video set 2' represent the first and second set of five opportunities within the video-based imitation assessment session (observed performance).

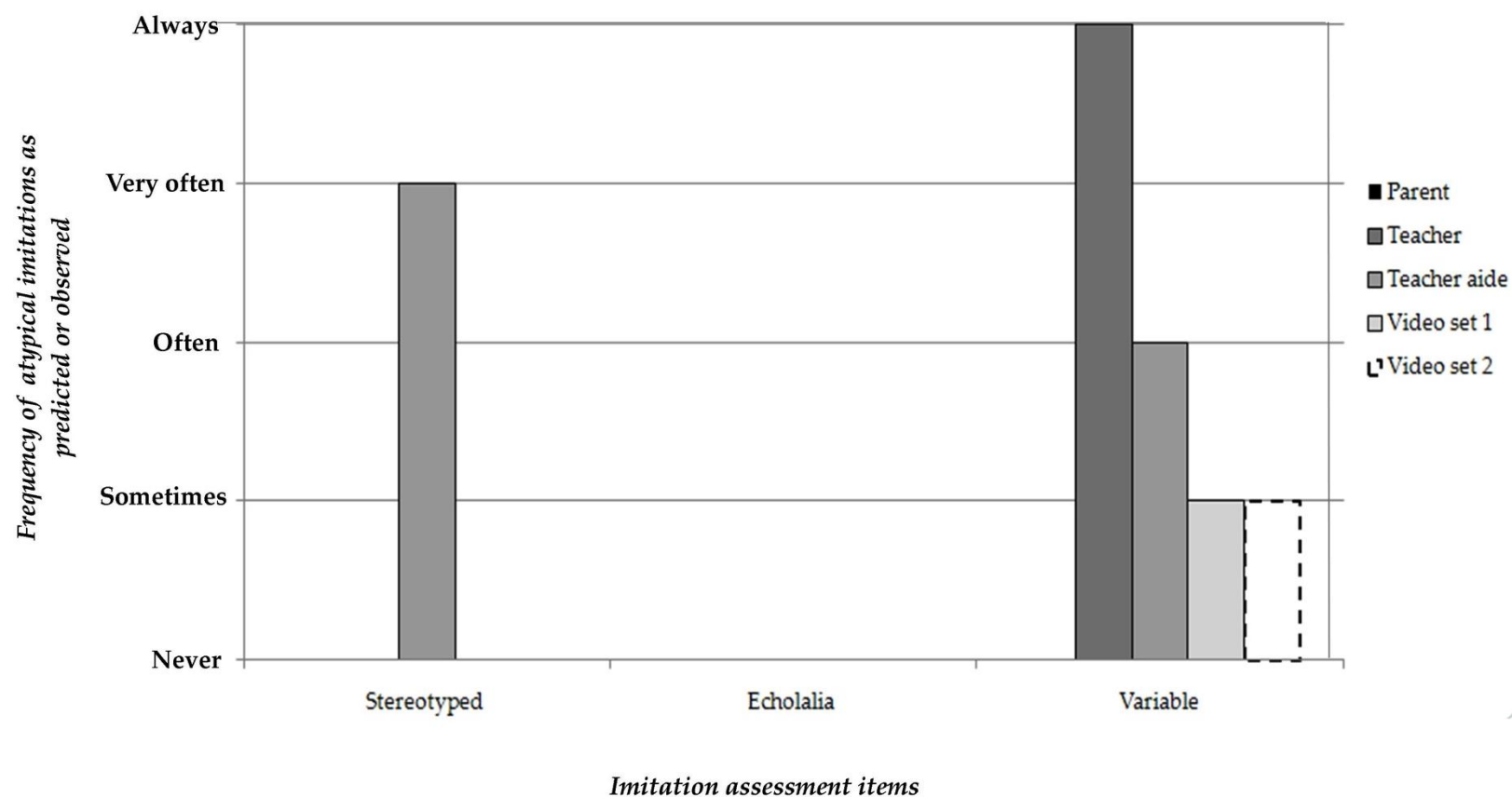


Figure 4-5. Regan's predicted (interview-based) and observed (video-based) imitation assessment scores for items 7, 8, and 9 from the *Imitation Disorders Evaluation* (IDE) of Malvy et al. (1999).

Inter-rater agreement within one value in the rating scale reached a high of 89% (8/9) between video set 1 and video set 2 as well as the teacher aide, and a low of 56% (5/9) between the teacher aide and the teachers as well as Regan's parents. Overall average agreement within one value in the rating scale across sources assessing Regan's imitative behaviour was 79% (see Table 4-2). Exact agreement between the researcher and a colleague for the video-based imitation assessment (across both Set 1 and Set 2) was 83%.

Table 4-2. Data showing agreement within one level for the assessment of Regan's predicted (interview-based) and observed (video-based) imitation behaviour.

	Parent	Teacher	Teacher aide	Video set 1	Video set 2	Average agreement
Parent	NA	67%	56%	78%	67%	67%
Teacher	67%	NA	56%	67%	78%	67%
Teacher aide	56%	56%	NA	89%	78%	70%
Video set 1	78%	67%	89%	NA	89%	81%
Video set 2	67%	78%	78%	89%	NA	78%
Overall average agreement						73%

4.3.5 Experimental design and target behaviours

Following the pre-baseline interviews and imitation assessments, a variation of a non-concurrent multiple baseline design was used to evaluate the effect of video modelling upon two of Regan's daily activities: (1) unpacking his bag upon arrival at

school; and (2) brushing his teeth. Generalisation of the unpacking bag task was evaluated by collecting data on how Regan performed the steps involved in packing his bag in the afternoon prior to leaving school and getting on the bus. The steps involved in these three behaviours are presented in Table 4-3.

Table 4-3. Task analyses for the target behaviours and generalisation measure.

Step	Unpacking school bag upon arrival	Packing school bag prior to departure (generalisation measure)	Tooth brushing
1	Take the school bag off his back	Take the school bag off the hook	Collect tooth brushing plastic sealable bag from cloak room space
2	Put the school bag on the table	Put the school bag on the table	Pick up tooth brush
3	Take the harness off	Take his harness out of the school bag	Put paste on
4	Put his harness in the school bag	Take the communication book from the appropriate tray	Close lid on tooth paste tube
5	Take out the communication book	Put the communication book into the front pocket of the school bag	Rinse brush with water before brushing
6	Put the communication book in the appropriate tray	Do up the school bag's front zip	Left side of mouth (side to side brushing x5)
7	Take out the lunch boxes	Open the fridge door	Left side of mouth (up and down brushing x5)
8	Open the fridge door	Take out the lunch boxes	Middle of mouth (side to side brushing x 5)
9	Put the lunch boxes in the fridge	Close the fridge door	Middle of mouth (up and down brushing x 5)

10	Close the fridge door	Put the lunch boxes in the school bag	Right side of mouth (side to side brushing x 5)
11	Take out a drink bottle from the bag	Open the fridge door	Right side of mouth (up and down brushing x 5)
12	Open the fridge door	Take out the drink bottle from the fridge	Spit into sink
13	Put the drink bottle in the fridge	Close the fridge door	Rinse brush with water after brushing
14	Close the fridge door	Put the drink bottle in the school bag	Put tooth brush into appropriate plastic sealable bag
15	Put the school bag on its hook in the cloak room	Do up the school bag's main zip	Put plastic sealable bag in cloak room space
16	(NA – 15 steps only)	Put the harness on (with assistance as necessary)	(NA – 15 steps only)
17		Put the school bag on	

4.3.6 Video production

A 2 minute 11 second video was produced for the unpacking bag task, and a 3 minute 12 second video was produced for the tooth brushing task. The same digital camera, software and laptop computer described for the video-based imitation assessment was used in the production of the unpacking bag and tooth brushing videos. The videos were recorded from the third-person perspective and featured the researcher who was unfamiliar to the participant prior to the study (see Figure 4-6). The unpacking bag video included an opening title which read, 'Welcome to school Regan! It's time to unpack your bag!' A closing screen which read: 'Well done Regan! Have a great day!' was followed by a screen with black and white squares in checkerboard fashion, as this was the common symbol used to express that an activity was finished throughout the school. Visual symbols with the text 'Unpack bag', 'Communication book', 'Lunch box and drink bottle' and putting the 'bag' away were also imbedded in the video. Visual support systems that make use of such symbols are widely used for individuals with ASD (Arthur-Kelly, Sigafoos, Green, Mathisen, & Arthur-Kelly, 2009). These visual symbols were embedded into the video for this study to connect this VBI with the communication support strategies regularly used in Regan's classroom.



Figure 4-6. A still image from the video used for the unpacking bag task.

The tooth brushing video contained an equivalent opening title and closing screen, as well as the checkerboard 'finish' screen. Only one visual/ text symbol was imbedded into the tooth brushing video, which was displayed after the opening title and before the actual tooth brushing steps, as seen in Figure 4-7. The tooth brushing video also used the same unfamiliar adult (the researcher) and the video was recorded from the third-person perspective (see Figure 4-8).

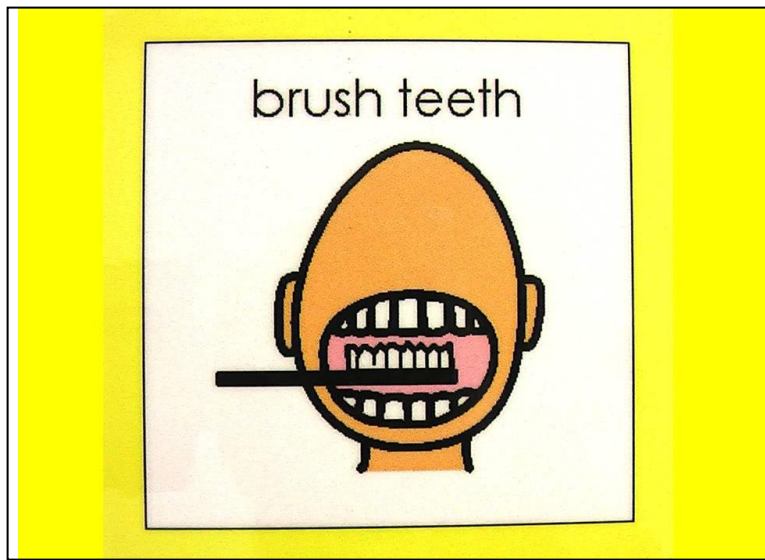


Figure 4-7. The symbol with the text and an image which was imbedded into the tooth brushing video.



Figure 4-8. A still image from the video used for the tooth brushing task.

4.3.7 *Experimental conditions for the unpacking school bag task*

4.3.7.1 **Baseline and withdrawal phases for the unpacking school bag task**

During the baseline (pre-intervention) and withdrawal (post-intervention) phases, the regular classroom practice was implemented. This involved welcoming Regan as he arrived and pointing him to his timetable (located above his desk), specifically identifying the first symbol (word and picture) 'Unpack bag'. The teacher and/or a teacher aide would prompt Regan verbally and by using gestures (touching their shoulders) to unpack his school bag. Unpacking steps which were not attempted or completed by Regan were completed by the teacher or a teacher aide so that staff and other students could continue with the daily classroom learning experiences and routines. Sessions were conducted for each consecutive day he attended school.

4.3.7.2 *Intervention Phases 1, 2, 3 and the follow up period for the unpacking school bag task*

Intervention Phase 1 involved welcoming Regan as he arrived and pointing him to the laptop computer on his desk. The video of the target behaviour was presented three times. If Regan stopped looking at the computer screen, the researcher paused the video and prompted him to attend by saying, 'Okay Regan, watch this' or words to similar effect before resuming the video. Once the video had been presented, Regan was given the opportunity to complete the target behaviour. As with baseline, verbal prompts and gestures were provided if Regan did not initiate the steps of the target

behaviour independently. Thus the only difference between baseline and Intervention Phase 2 was the presentation of the video model.

Intervention Phase 2 was conducted in the same way as Intervention Phase 1, except that in Intervention Phase 2 the video was shown only once. No video was shown in Intervention Phase 3. Conditions for Intervention Phase 3 were the same as in baseline in all but one aspect: laminated visual symbols with the text 'Unpack bag', 'Communication book', 'Lunch box and drink bottle' and 'put away schoolbag', similar to those imbedded in the video, were available to supplement the verbal prompts. As the use of the visual symbols for Intervention Phase 3 were adopted into regular classroom practice after the intervention phases, the first three sessions of the follow-up period, collected 40 days after withdrawal, were conducted using the same conditions as those in Intervention Phase 3. As a pragmatic measure, the last three sessions in the follow-up period were conducted in the same way as Intervention Phase 2.

4.3.7.3 *Generalisation*

As evident in Table 4-3, the packing of the school bag task was conceptually a reverse of the unpacking of the school bag task. Data collection sessions for the generalisation measure began on the same afternoon as the fifth session (the last session of baseline) for the unpacking bag task. During all generalisation sessions, verbal prompts and gestures were provided if Regan did not initiate a step in the sequence (as

in sessions relating to the unpacking bag task), but no video model was presented for the specific task throughout the study. Both the teachers and the researcher initially considered it unlikely that the intervention would generalise to the packing bag task, and had therefore planned to include this afternoon task as a separate target behaviour. This task provided the opportunity to evaluate whether or not generalisation would occur from the unpacking of the school bag task to the packing of the school bag task before we intervened on the latter.

4.3.8 Experimental conditions for the tooth brushing task

4.3.8.1 Baseline for the tooth brushing task

Baseline for the tooth brushing task commenced on the same day as the fifth session of the unpacking bag task. During baseline, the symbol (with text) for tooth brushing was displayed on Regan's timetable. When it was time for him to brush his teeth, his teacher directed him to his timetable and say, 'It's time to brush your teeth.' The teacher or a teacher aide retrieved the sealable plastic bag with Regan's tooth brush and toothpaste from his section of the cloakroom and brought it out to him, as Regan did not initiate this behaviour. Once he was at the sink with his tooth brush and toothpaste, the teacher applied the toothpaste while Regan held his brush, as it was anticipated that he may use the toothpaste tube and its contents inappropriately. Regan's classroom teacher, using a finger as a toothbrush, provided in-vivo modelling

for Step 8 in the first three sessions of baseline. A verbal prompt was provided to indicate the finish of tooth brushing and the teacher or teacher aide put his bag with the tooth brush and toothpaste away in the cloakroom.

4.3.8.2 Intervention Phase 1 for the tooth brushing task

The conditions for Intervention Phase 1 were the same as baseline, except that Regan was shown the video of the tooth brushing sequence once, prior to engaging in the target behaviour sequence himself. The video was played through a laptop computer positioned on a table adjacent to the sink, with approximately one metre separating the video from the sink. Regan was prompted to attend to the screen if necessary, as in the unpacking bag task. He was also given the opportunity to put his sealable bag with tooth brush and toothpaste away in its place in the cloakroom himself (Step 15). In this session the video was shown once because of Regan's lack of consistent attention to the video and because of restrictions on time to finish the task due to other classroom commitments.

4.3.8.3 Intervention Phase 2 the tooth brushing task

Intervention Phase 2 sessions were the same as those in Intervention Phase 1, except that the video was shown twice. Regan was also given the opportunity to collect his sealable bag from the cloakroom, apply the toothpaste independently and close the lid of the toothpaste tube (see steps 1, 3, and 4 in Table 4-3).

4.3.8.4 Intervention Phase 3 the tooth brushing task

The conditions for sessions in the Intervention Phase 3 were the same as those in Intervention Phase 1, except that a variation of a video prompting (VP) procedure was used in place of the VM procedure. This VP procedure was as follows: the first three steps were shown together and then Regan was given an opportunity to complete these steps (following a verbal instruction); step 4 and an opportunity to perform it were provided; steps 5 to 10 were shown concurrently to the opportunity to perform them, pausing where necessary; steps 11 and 12 were shown individually followed by an opportunity to perform them; and steps 13 and 14 shown together before providing an opportunity for Regan to perform them.

4.3.8.5 Intervention Phase 4 the tooth brushing task

The conditions for sessions in the Intervention Phase 4 were the same as those in Intervention Phase 3 except that live modelling was provided for steps 5 to 10 in addition to the VM presented via the laptop computer. The researcher directed Regan to the laptop screen to view the video model of the tooth brushing step. Then the researcher paused the video and directed Regan's attention to his live demonstration of the brushing step, saying 'Watch this' or an equivalent phrase.

4.3.8.6 *Withdrawal and follow-up the tooth brushing task*

Conditions in the withdrawal and follow-up phases were the same as baseline except that Regan was given the opportunity to collect his sealable plastic tooth brushing bag from the cloakroom, apply the toothpaste, close the toothpaste tube lid and put his return bag to the cloakroom independently (steps 1, 3, 4, and 15). Three follow-up sessions were conducted 29 days after the last withdrawal session. Follow-up sessions were conducted in the same way as withdrawal sessions.

4.3.9 *Data collection and reliability measures*

For all target behaviours, experimental conditions and sessions, the number of steps Regan performed correctly was recorded. Steps not performed were either indicated by a dash or marked as not assessable (NA). It was important to note the steps that were NA because there was variation in the actual number of steps that Regan could perform across the sessions. For example, while on most Thursdays and Fridays Regan arrived to school on the bus wearing his harness, on Mondays, Tuesdays and Wednesdays he came in his parents' car without his harness on, and thus the step or steps relating to the harness were not to be completed and marked as NA. Regarding the generalisation measure, because Regan would often put his lunchbox and drink bottle back in his bag after lunch it did not seem reasonable to continually take them out of his bag, put them back in the refrigerator and require him to continue retrieving them from

there. While this was done in four of the generalisation sessions (7, 8, 9 and 14) and provided an opportunity for measuring the extent of the generalisation from the unpacking bag to the packing bag tasks, these steps were marked as NA on most other occasions.

In addition to the researcher who collected data for all sessions, a second observer collected data for: eight sessions (33%) of the unpacking bag task; five sessions (26%) of the packing bag generalisation measure; and eight sessions (38%) of the tooth brushing task. Regan's two classroom teachers acted as the second observer as did two teacher aides. Inter-observer agreement (IOA) was calculated using the formula:

$$\text{Percentage of agreement} = \text{points of agreement} / \text{number of items} \times 100$$

IOA ranged from a low of 93% to a high of 100% with a mean of 97% for the unpacking bag task. Agreement ranging from 94% to 100% with a mean of 98% was reported for the packing bag task. For the tooth brushing task, inter-observer agreement ranged from a low of 86% to a high of 100% with a mean of 97%. Inter-observer agreement data for the time taken for the unpacking bag task were only available for 5 sessions (21%), where the time was within one minute across observers for four sessions (sessions 3, 4, 19 and 20). The time recorded for session 10 differed by 6 minutes, due to alternative starting times being recorded. For session 10, the longer time has been reported in the results.

4.4 Results

4.4.1 *Unpacking bag and packing bag tasks*

The intervention led to a rapid increase in the percentage of steps Regan performed for the unpacking bag task upon arrival at school (see Figure 4-9). During baseline Regan performed between 8% (step 1) and 27% (steps 1, 3, 11 and 15) of the possible steps, with an average of 17%. These baseline data were consistent with the anecdotal observations of Regan's teachers over the previous year and a half. The percentage of steps completed rose to 67% in the second and 92% in the third session of intervention. Except for session 15 (Intervention Phase 3), Regan's performance of the unpacking bag task showed only slight variation between sessions throughout intervention and withdrawal phases, with an overall average of 76% of steps completed per session.

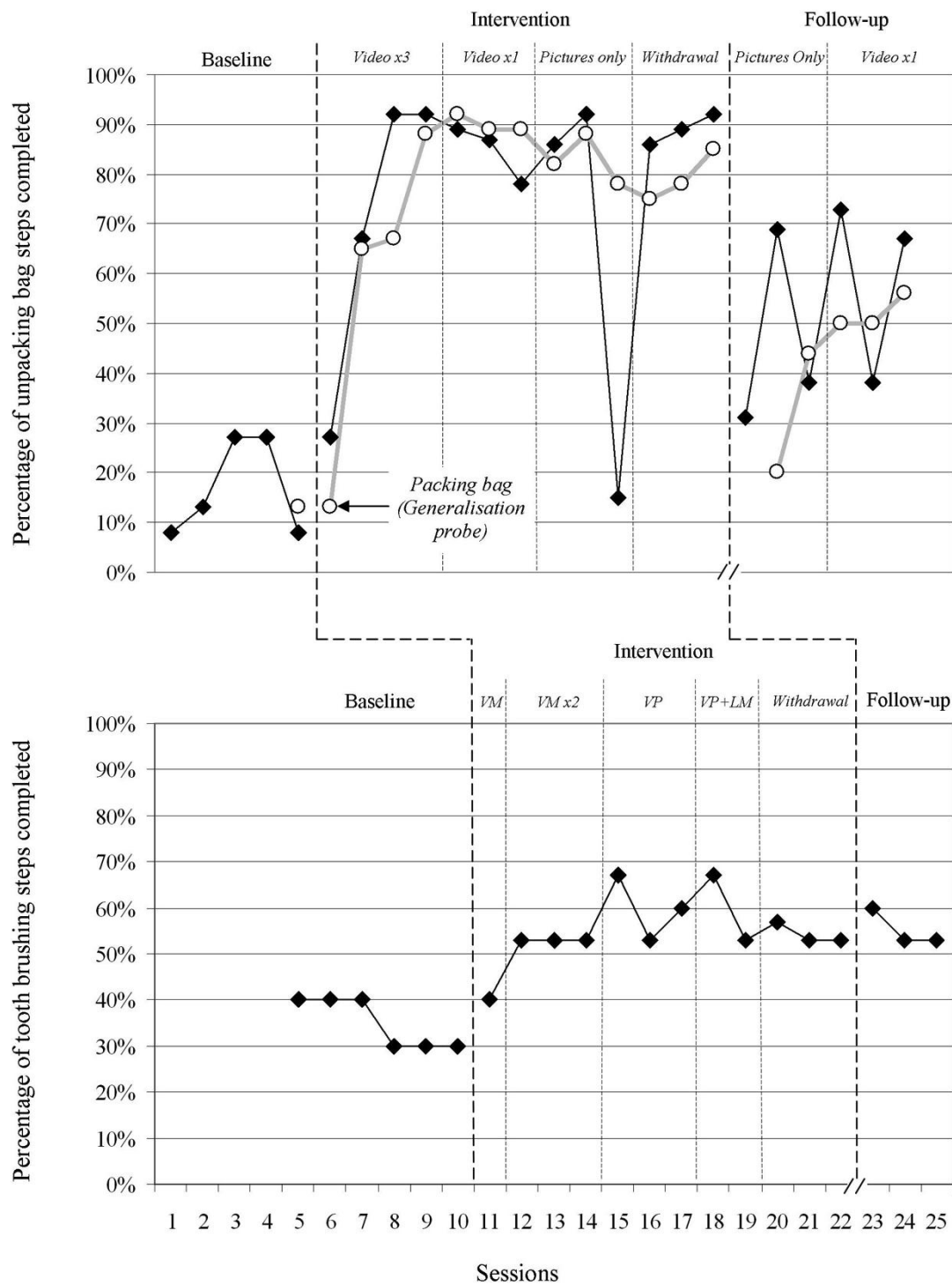


Figure 4-9. Graph showing the percentage of steps completed by Regan across the target behaviours for each daily session.

Regan seemed to be unusually upset upon arrival at school for session 15, which affected these results. After a period of crying, self-injurious and violent behaviour, he was directed out of the classroom and given an opportunity to calm himself before re-entering the classroom and engaging with the planned learning experiences. Step 2 (putting his bag on the table) was the only step of the unpacking bag task Regan did not perform in any session. While it was part of the behaviour demonstrated in the video model, his lack of participation in this step did not hinder his ability to complete the rest of the task in a practical and appropriate way.

Data presented in Figure 4-9 suggests that the intervention led to the generalisation of Regan's performance of the unpacking bag task to the packing bag task. In the afternoon following the last session of baseline and the first session of intervention for the target behaviour (unpacking bag), Regan performed 13% of steps of the packing bag task, which involved putting his harness on with assistance. While there was only one session measuring generalisation during the baseline phase, the results were consistent with the teachers' anecdotal observations over the last year and a half, as it was with the unpacking bag task. Following these two sessions, Regan demonstrated a rapid increase in the percentage of packing bag steps completed, reaching a high of 92% in the sixth session for which generalisation data were collected.

Regan's performance of both the unpacking and packing tasks at 40 days after the withdrawal phases seemed to have lapsed from the consistent performance recorded during intervention and withdrawal phases. The percentage of steps completed ranged

from a low of 38% to a high of 73% for the unpacking bag task and from a low of 20% to a high of 56% for the packing bag task.

In the packing bag task, the only step Regan did not perform in any session was putting his bag on his back himself. It was clear that he had the motor coordination to do this, because he had often been observed putting his bag on his back after taking it off temporarily during the morning task. Instead of acting independently, Regan would indicate by pointing that he wanted a teacher or teacher aide to help him with the bag, at which point he would cooperate with putting it on his back. This was one of several obsessive, rigid patterns of behaviour that persisted despite the increased independent performance of steps in both the unpacking and packing bag tasks. Regan persisted with arranging his socks, shoes, harness and bag in the mornings (as previously described). He also continued to insist on putting on his socks and shoes prior to performing other functional steps of the pre-departure packing bag task.

4.4.2 Tooth brushing task

As shown in Figure 4-9, a limited increase in the number of steps Regan performed for the tooth brushing sequence was observed when comparing only the steps that he had opportunity to perform in both baseline and intervention conditions. Regan's performance was characterised by a lack of participation in the actual brushing steps of the task, as well as in rinsing before brushing, with a high of four steps in baseline compared with a high of six steps during intervention phases. Nevertheless, following the VM intervention, Regan demonstrated greater independence in the

sequence when given the opportunity to perform all the steps in the behaviour chain, with a high of ten steps completed. These additional behaviours had not been observed prior to intervention and the classroom teachers considered that the VM was responsible for his acquisition of the behaviours. While he had never initiated these behaviours prior to intervention, they were performed for him in baseline without giving him time to initiate or perform these steps of the tooth brushing task. Therefore it would not be appropriate to make a comparison regarding these steps between baseline and intervention conditions in this study. Regan's performance of the tooth brushing task during follow up one month after the last withdrawal session was consistent with that of the withdrawal phase (see Figure 4-9).

4.4.3 Social validity

Between the withdrawal phase and follow-up period, both teachers were given the opportunity to provide written feedback relating to the social validity of the interventions. Questions asked of the teacher related to: (1) the social importance of the target behaviours; (2) the implications of the gains made; and (3) the extent to which the intervention was enjoyable for the participant (see Appendix F). For the unpacking and packing bag tasks, both teachers indicated that the target behaviours were quite important to Regan, that the intervention led to Regan being able to quite independently complete the tasks and that he seemed to find learning from video models in the study to be enjoyable. Their optional comments are reported here verbatim:

The video modelling was an effective strategy to develop this skill for Regan. It enabled him to change a rigid routine relatively quickly and he has maintained the skill beyond the study.” (Teacher 1)

“The ‘ritual’ associated with Regan’s bag has been a long standing one that prevented Regan from expanding his skills and independence. In the past it has proved very difficult and stressful for all involved to change these rituals but the video modelling was effective and not at all stressful. (Teacher 2)

One teacher suggested that the tooth brushing task was quite important for Regan, the other extremely important. They both indicated that as a result of the VM intervention, Regan could now complete some aspects of the tooth brushing task independently, and that he seemed to enjoy learning from video models in this study. As well as her comments regarding the unpacking and packing bag tasks, Teacher 2 wrote in regard to the tooth brushing task: ‘Ditto previous comments about rituals but in addition, this was an effective way to highlight skills Regan can’t do versus skills he won’t do.’

4.5 Discussion

4.5.1 Utility of the imitation assessment (IDE) procedures

The use of the video-based imitation assessment procedures informed by the IDE scale (Malvy et al., 1999) implemented in this study provided helpful predictive information regarding Regan’s responsiveness to the VM intervention. First, the video-based assessment allowed some formal measurement of Regan’s imitative performance

of behaviours presented via video. In this case the results of the assessment were used to provide evidence to support the implementation of a VM intervention for socially important behaviours in Regan. Second, it highlighted the kinds of behaviours that he would be more likely to successfully imitate (such as actions with objects) and less likely to successfully imitate (such as facial expressions) when presented via video.

The acquisition of new behaviours relating to the unpacking bag, packing bag and tooth brushing tasks provides some support for the predictions based on the imitation assessment and is consistent with the suggestion that individuals with strengths in visual processing, visual learning and visual memory may be suited to VBI (Sherer et al., 2001). Regan's high scores in written communication relative to other sub-domains in the VABS (Sparrow et al., 2005b) may also reflect the strength of his visual memory and visual processing skills relative to other skills.

Informally, the video-based assessment yielded information about Regan's ability to attend to the computer as well as about whether his performance with imitating the behaviours he observed. While the video was just under 10 minutes in length, the session took 20 minutes due to Regan frequently walking away from the computer. Also, that Regan more frequently imitated behaviours presented in the first set of imitative opportunities (Video Set 1) than in the second set of opportunities (Video Set 2) suggests that limitations in his ability to maintain attention to the task affected his performance.

Imitation assessment procedures, such as those implemented in this study, could be utilised by parents, teachers and practitioners to provide predictive information

about the efficacy of VBI for individuals with autism. This study provides preliminary support for the use of a formal assessment of imitation based on behaviours presented via video to be conducted for the purpose of predicting success and informing VM interventions. This support is drawn from the finding that the highest scores for imitative performance and the highest level of agreement were recorded through the use of the video-based imitation assessment conducted via video. The video-based imitation assessment procedures are also a close approximation of the VM interventions. Low levels of agreement, such as those between the parent and the teacher, may serve to illustrate the subjectivity in the interview-based imitation assessment procedure. These low levels of agreement may also reflect real differences in Regan's behaviours across settings (i.e. school and home). Thus, this finding further supports the use of an observation-based imitation assessment conducted in the same context as the proposed intervention.

4.5.2 Effectiveness of VM to increase Regan's independence

Regan's positive response to VBI supports recent literature that suggests this to be an effective procedure for teaching daily living skills to individuals with autism (Ayres & Langone, 2005; Bellini & Akullian, 2007; Darden-Brunson et al., 2008; Delano, 2007a; McCoy & Hermansen, 2007; Mechling, 2005; Rayner et al., 2009). Through VM, Regan improved in the unpacking bag and packing bag task. VM was used to teach skills that competed with longstanding, obsessive and inflexible patterns of behaviour. As the ability to generalise from learned behaviours to other behaviours or contexts can be particularly difficult for individuals with autism (Charlop-Christy et al., 2000; Delano,

2007a; Nikopoulos et al., 2009), the increase in Regan's independence with the afternoon routine (packing bag task) associated with the intervention which targeted the morning routine (unpacking bag task) is also noteworthy.

In addition to capitalising on strengths in visual processing and increasing stimulus control, the success of the VM intervention to modify a restricted pattern of behaviour could be explained by its effects on motivation. The influence of VM upon a participant's motivation has been offered as an explanation in previous studies (Charlop-Christy et al., 2000). In the present study, it was observed anecdotally that the time taken to perform functional steps in the unpacking bag task was influenced by whether or not the activity following the routine was reinforcing to Regan. For example, Regan performed steps of the unpacking bag task in less time (12 minutes) when completion of the task was followed by an excursion (Session 14) than when followed by regular classroom work. It follows that identifying and providing preferred activities contingent upon completion of the task could have led to reductions in the time taken. Due to the unpredictable time of Regan's arrival and with limitations on making changes to his timetable, it was not feasible for the researcher to include the provision of preferred activities on completion of the task. Despite the apparent role of motivation regarding the time to complete the task, because of the lack of reduction in session time from baseline to intervention, it would seem unreasonable to attribute the changes in rates of participation to changes in motivation alone.

Alternatively, the video model of the unpacking bag task in this study may have functioned in a similar way to a video priming procedure, in which the task is made

more predictable (Schreibman et al., 2000). Another explanation is that the presentation of a behavioural sequence via video altered Regan's rigid conceptual repertoire for the task, allowing for the inclusion of functional behaviours within the task. Support for this explanation could only be drawn from further research which sought to introduce functional behaviours (as in the present study) and/or replace non-functional behaviours that exist within target behaviours associated with a history of behavioural inflexibility. In this case, while new, functional behaviours were included into the routine, Regan persisted with some of the obsessive ritualised behaviours that had previously characterised the routine, such as the arrangement of his socks, shoes, bag and harness.

In the present study, VM intervention had limited success in teaching Regan to brush his teeth. This is in contrast to the study of Charlop-Christy, Le, and Freeman (2000) in which Tony, a 7-year-old boy with autism reached criterion for brushing his teeth after only three sessions of a VM intervention. Differences in these results could be attributed to the participant characteristics. Like Regan, Tony's behaviour was characterised by the performance of ritual acts and an insistence on sameness (Charlop-Christy et al., 2000). But in comparison, while Tony was chronologically younger than Regan at the time of the respective studies, scores from standardised assessments suggest that Tony was more advanced in terms of adaptive behaviour.

Although it seems reasonable to expect the effectiveness of VM to be influenced by the level of functioning of the participant (Sigafoos et al., 2007c), differences between the results of the present study and that of Charlop-Christy, Le, and Freeman (2000) for teaching tooth brushing may also reflect differences in the task analysis and operational

definitions of the target behaviours. Regan's lack of performance of the actual brushing steps may have been simply due to difficulties with the fine motor skill requirements of the task. Scores for fine motor skills on the *Vineland Adaptive Behaviour Scales* (VABS) (Sparrow et al., 2005a) and general observations of Regan seemed to suggest otherwise. It may have been that the sensory reinforcement he derived from chewing on the toothbrush competed with the more functional brushing behaviours modelled on video. If the video provided motivation to perform the behaviours modelled, in this case, such motivation was insufficient to sustain Regan's efforts to engage in the fine motor performances of the brushing actions. Indeed, the tooth brushing task involved a number of sensory experiences which seemed to be reinforcing for Regan and which he would tend to repeat or fixate upon; such as turning the tap on to rinse the brush and suck water from his brush to rinse his mouth.

Despite some limitations in making comparisons between baseline and intervention for the additional steps of the tooth brushing task (1, 3, 4, and 15), the results suggest that Regan gained greater independence in the task following the introduction of the VM intervention. The teachers themselves suspect that Regan's independence in these behaviours was the result of the modelling. The depiction of a chain of behaviours for tooth brushing which included preparatory and concluding steps seemed to be a catalyst for increasing the expectation held by teaching staff regarding the level of independence Regan could demonstrate in this daily routine.

Maintenance of the tooth brushing task seemed to be stronger than for the unpacking and packing bag tasks. This could be due to the way changes in the

classroom activities and environment at the end of school term affected these transitionary behaviours associated with an insistence on sameness more than they affected the daily living task of tooth brushing. It could also be that Regan's performance of the unpacking and packing bag tasks was more susceptible to reversion to previous patterns of behaviour, or that the tasks were open to the introduction of new obsessive behaviours. For example, during the intervention and withdrawal phases, Regan insisted that all zips on his bag be done up, but during follow-up he insisted that all zips be left undone. Unfortunately, due to the end of term we were not able to evaluate the re-introduction of VM or other interventions to support Regan in performing the unpacking and packing bag task at levels consistent with the intervention phases of the research.

4.5.3 Limitations of the study and directions for future research

In addition to issues relating to the timing of the school term, the present study was limited in several ways. With packing his bag being included as a generalisation measure the study enabled only two comparisons across baseline and intervention conditions. Also, baseline data were limited to one session for the packing bag task. No measures of generalisation were reported for the tooth brushing task, and as mentioned previously, the disparity between potential steps in baseline and intervention phases mean that Regan's performance of steps 1, 3, 4 and 15 for tooth brushing cannot confidently be attributed to the independent variable. Furthermore, variables which may have affected Regan's performance of the target behaviours such as the teachers, the

time of Regan's arrival, and the sequence of classroom activity were not controlled in this study. Due to limitations in personnel, treatment fidelity was not assessed.

Despite these methodological limitations, the present study demonstrates the strengths and limitations of a novel method for evaluating the suitability of VBI for a particular individual through an imitation assessment. It provides an example of how individualised VBI can be implemented in an applied, classroom setting and how such interventions may be effective for teaching daily tasks to non-verbal individuals with autism whose behaviour has been characterised by rigid and obsessive routine associated with non-compliance.

Further research may more clearly articulate the relationship between scores on similar imitation assessments and the effectiveness of VBI for teaching students with autism. The findings of the present study, together with those of Schreibman, Whalen, and Stahmer (2000) and Nikopoulos, Canavan, and Nikopoulou-Smyrni (2009) also warrant further exploration of the efficacy of VBI, such as VM and video priming, to address issues associated with the deficits in behavioural flexibility which typify autism. Such research should evaluate the use of VM for modifying existing ritualistic patterns of behaviours. Similarly, further research could explore the use of VM to teach adaptive responses, such as problem solving or help seeking strategies, to cope with situations that require behavioural flexibility (see Green et al., 2007; Green et al., 2006b)

Chapter 5 - Study 2: Sibling-as-Model and Adult-as-Model Video-Based Intervention to Teach a Student with Autism

5.1 Overview

Video modelling (VM) is an evidence-based intervention approach for teaching individuals with autism. In this study, the imitation ability of Mathew, a 15 year-old boy with autism, was assessed and then the use of VM to teach him to match coins, respond to questions in a group discussion time and prepare noodles was evaluated. Matthew seldom responded to imitative opportunities in the assessment and although he learnt to perform some of the steps in the noodle preparation task during baseline, no changes in his ability to perform the three target behaviours resulted from either the adult-as-model or sibling-as-model conditions. Thus, his limited imitation skills provide an explanation for why the VM procedure was not an effective intervention approach for Matthew. These findings regarding participant prerequisite skills and model type are discussed in terms of future practice and research.

5.2 Introduction

Forms of VBI, such as VM, have been described as evidence-based practices for teaching individuals with autism (Bellini & Akullian, 2007). More recently, VBI have also been described a promising evidence-based practice to specifically target social skills intervention (Reichow & Volkmar, 2010). Notwithstanding, further research regarding the participant characteristics which predict an individual's suitability for VBI as well as the relative efficacy of different types of model for this population has been

warranted by reviews of this intervention approach (McCoy & Hermansen, 2007; Rayner et al., 2009). In *Chapter 2* (as described in Rayner et al., 2009), the lack of assessment for prerequisite skills, such as attention and imitation, in a number of VBI was identified. Subsequently, a discussion of several strategies used to assess prerequisite skills in conjunction with VBI was provided. Following Study 1 with Regan, reported in the previous chapter, the current study provides a second opportunity to evaluate the utility of these imitation assessment procedures as a predictive tool regarding the efficacy of VBI for a student with autism.

While the relative efficacy of ‘self’ versus ‘other’ as model was investigated through an examination of relevant literature in *Chapter 2*, few studies have investigated the effectiveness of siblings as models in VBI. This is despite the finding that the nature and the length of the model/learner relationship have been important factors in effective modelling programs for children with disabilities (Jones & Schwartz, 2004). Typically developing siblings have often been proud of their ability to help teach their brother or sister with autism (Rivers & Stoneman, 2003), and often have the advantage of being present to support the individual with autism outside the classroom (Tsao, 2006).

Jones and Schwartz (2004) compared sibling, peers and adults as models for teaching novel language skills to three children diagnosed with an ASD. They found that participants learned the relevant skills from all three model types and that there did not appear to be any differences in the relative effectiveness of sibling, peer or adult models. However, the study by Jones and Schwartz (2004) used a live modelling approach, and not VM. Two published VM studies have involved siblings as models

(Reagon et al., 2006; Taylor et al., 1999). Taylor, Levin and Jasper (1999) involved siblings in the video, but the adult in the video was modelling the behaviours the participant would be engaging in with their sibling. Thus, an 'adult-as-model' procedure was implemented, with the sibling being the communicative partner for the participant's performance of the play-related statements. Reagon, Higbee and Endicott (2006) improved the pretend play skills a four-year-old boy with autism through a VM intervention which involved his older brother as a model. They noted that increased accessibility of the technology required for creating VM materials for families made the use of siblings as models practical as an intervention approach, but their study did not compare the effectiveness of the sibling with other model types. In order to further investigate the efficacy of involving siblings as models in VBI for individuals with autism, this case study alternated sibling-as-model with adult-as-model conditions.

A secondary aim of the present study was to compare the participant's imitative response to human models and animated models presented via video. Animated models have long been demonstrated to affect the behaviour of children (Bandura, Ross, & Ross, 1963a). According to observational learning theory, highly preferred models are more successful in promoting attention and imitation by the learner (Bandura, 1977, 1986). The increase in the availability of animated models through popular media (Golan et al., 2010), as well as the increased availability and capabilities of software to customise animated models, together with the demonstrated efficacy of VBI for individuals with autism warrants investigation into the use of animated models for educational purposes with this population.

5.3 Method

5.3.1 Participant

Matthew was diagnosed with autism as a two year old and was 15 years of age at the time of the study. He attended a school which catered specifically for students with multiple/severe disabilities. Through interviewing Matthew's parents at the time of the study, Matthew scored 38.5 on the *Childhood Autism Rating Scale* (CARS) (Schopler et al., 1988), which placed him in the 'severely autistic' range. Based on scores from the *Vineland Adaptive Behaviour Scales* (VABS) (Sparrow et al., 2005a, 2005b), Matthew had an adaptive behaviour age equivalent of three years and eight months (see Figure 5-1 and Table 5-1). Matthew enjoyed sailing, spending time with his grandparents, and his weekly family pizza night.

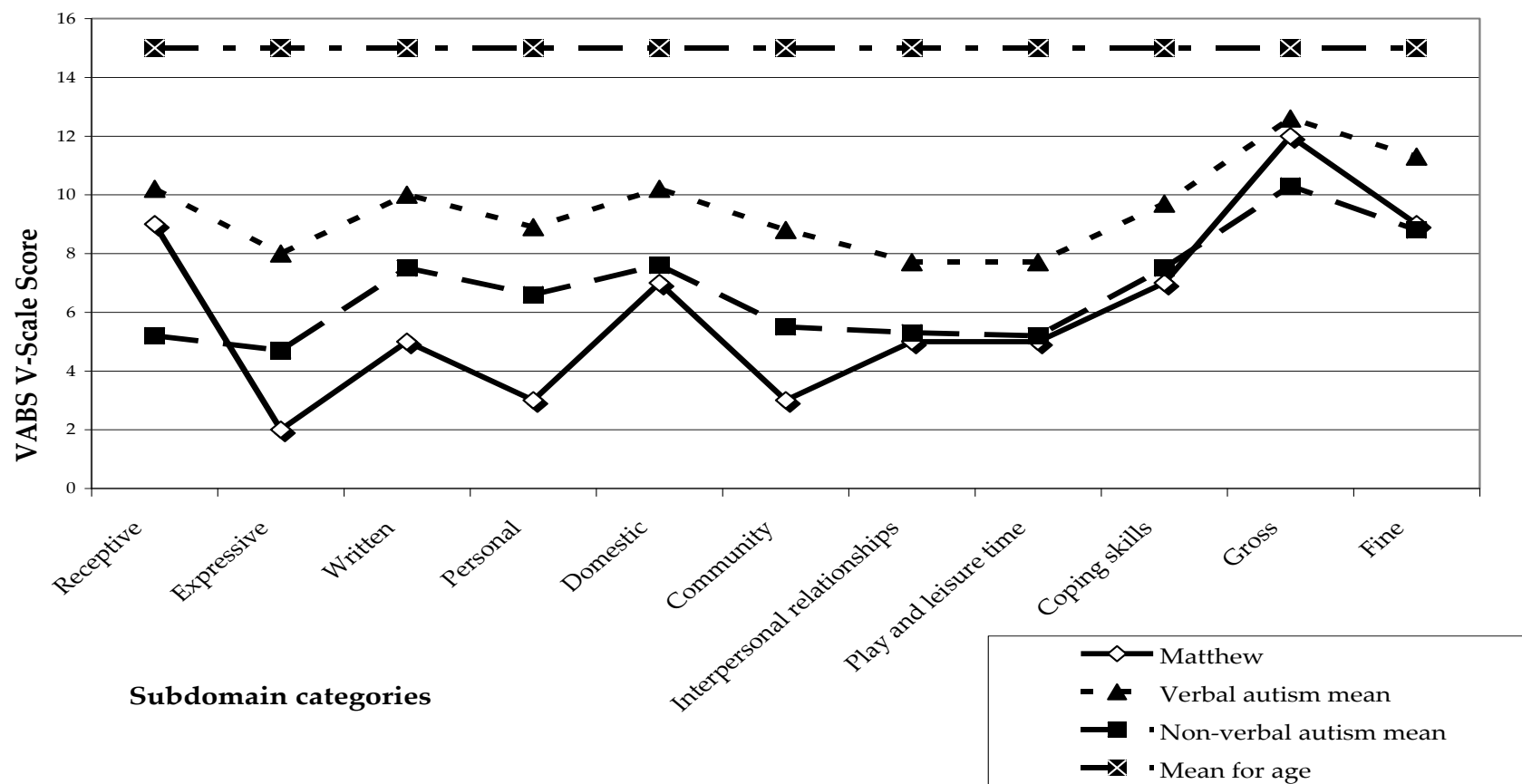


Figure 5-1. Graph showing Matthew's VABS V-Scale scores in comparison to the means for individuals with verbal autism and non-verbal autism, as well as typically developing individuals at the same chronological age (Sparrow et al., 2005a).

Table 5-1. Summary of Matthew's adaptive behaviour according to a VABS assessment.

Domain	Sub-domain	Age equivalent (years : months)
Communication	Receptive	4:11
	Expressive	2:1
	Written	4:2
Daily living skills	Personal	3:1
	Domestic	5:11
	Community	3:6
Socialisation	Interpersonal relationships	2:4
	Play and leisure time	2:11
	Coping skills	2:11
Motor skills	Gross	4:7
	Fine	3:11
Overall average		3:8

5.3.2 Setting

The video-based imitation assessment as well as baseline and intervention sessions for all three target behaviours were conducted within Matthew's regular classroom. Matthew shared the classroom with up to five peers who had a variety of diagnoses. Each day the teachers were supported by two or three teacher aides, depending on the students' attendance on the day. A large table composed of several desks was in the centre of the classroom space, where Matthew would engage in learning activities and also eat his morning tea and lunch. The classroom contained a

kitchen area with sinks, built in cupboards, an oven, a microwave and a refrigerator. The classroom also included an area for group discussions and story reading, separated from the main part of the classroom by a door and wall with windows.

5.3.3 *Imitation assessment*

Prior to baseline, Matthew's imitation behaviour was assessed in three ways, two of which were informed by the IDE scale (Malvy et al., 1999). As with the previous study with Regan, one approach involved interviewing Matthew's parents, his teacher, and a teacher aide who was well acquainted with him using nine questions – each of which related to an item of the IDE scale. The second approach involved the video-based imitation assessment as per the study with Regan as described in *Chapter 4*.

The third approach was in addition to the procedures implemented for Regan. The imitation assessment for Matthew also involved presenting him with an animated model performing 12 gross motor movements via the laptop computer (see Figure 5-2). This video was produced using a trial version of the CodeBaby® production studio (2010). This software enables the user to synchronise the mouth movements of the animated model with audio files imported by the user. This enabled speech including greetings, brief directions and voice-overs for the gross motor movements produced by the researcher to be imbedded appropriately into the video. This video was 2 minutes and 31 seconds in length.



Figure 5-2. Screen shot of the animated model used as part of the imitation assessment procedure.

Another comparable video, lasting 2 minutes and 30 seconds and featuring the researcher as model, was produced in which the same gross motor movements and the same speech as in the animated model video were presented with a similar white background. While the sequence of movements did not represent the spectrum of behaviours of the IDE, the purpose of these shorter videos was to provide an initial exploration into the relative efficacy of animated models in comparison with real adult models. Matthew's attention was maintained by verbal prompts as in the IDE based assessment procedure. For each gross motor movement in both videos, the researcher recorded whether Matthew performed the movement, partially performed the movement or did not perform the movement (see Appendix E).

To ensure that Matthew's performance in the 2pm video-based imitation session (including each of the three videos) was sufficiently representative of his imitative

behaviour, a second session was conducted five days later at 9am. The first video-based imitation assessment session was conducted with Matthew seated at an isolated table in the main classroom space, and the second was conducted in the separated learning space. After the video-based imitation assessment informed by the IDE was conducted, the videos featuring the animated and real adult models were presented; the animated model video was presented before the real adult model video in the first session and vice versa for the second session. (As each video-based imitation assessment session consists of two sets of five imitative opportunities, these results of the video-based assessments are described in Figure 5-5 as 'Video set A1' and 'Video set A2' for the initial afternoon session, and 'Video set B1' and 'Video set B2' for the morning session conducted five days afterwards.)

Based on the responses recorded from the interviews with Matthew's mother, his teacher and a teacher aide, Matthew seemed to possess limited imitation skills (see Figure 5-3). Although scores were low for the imitation disorders outlined in items 7, 8 and 9 (see Figure 5-4), during the video-based imitation session, he did not demonstrate any appropriate imitations for items 1, 4, 5 or 6. However, Matthew demonstrated the ability to attend to the video models, as evident by his scores of 18 from 20 opportunities for item 2 ('visual pursuit'), inclusive of both sessions. Matthew imitated only two of the 12 actions modelled by the animated character in the first session. He did not imitate any of the 12 actions modelled by animated character in the second session or by the human character in the comparative video in the first or the second session.

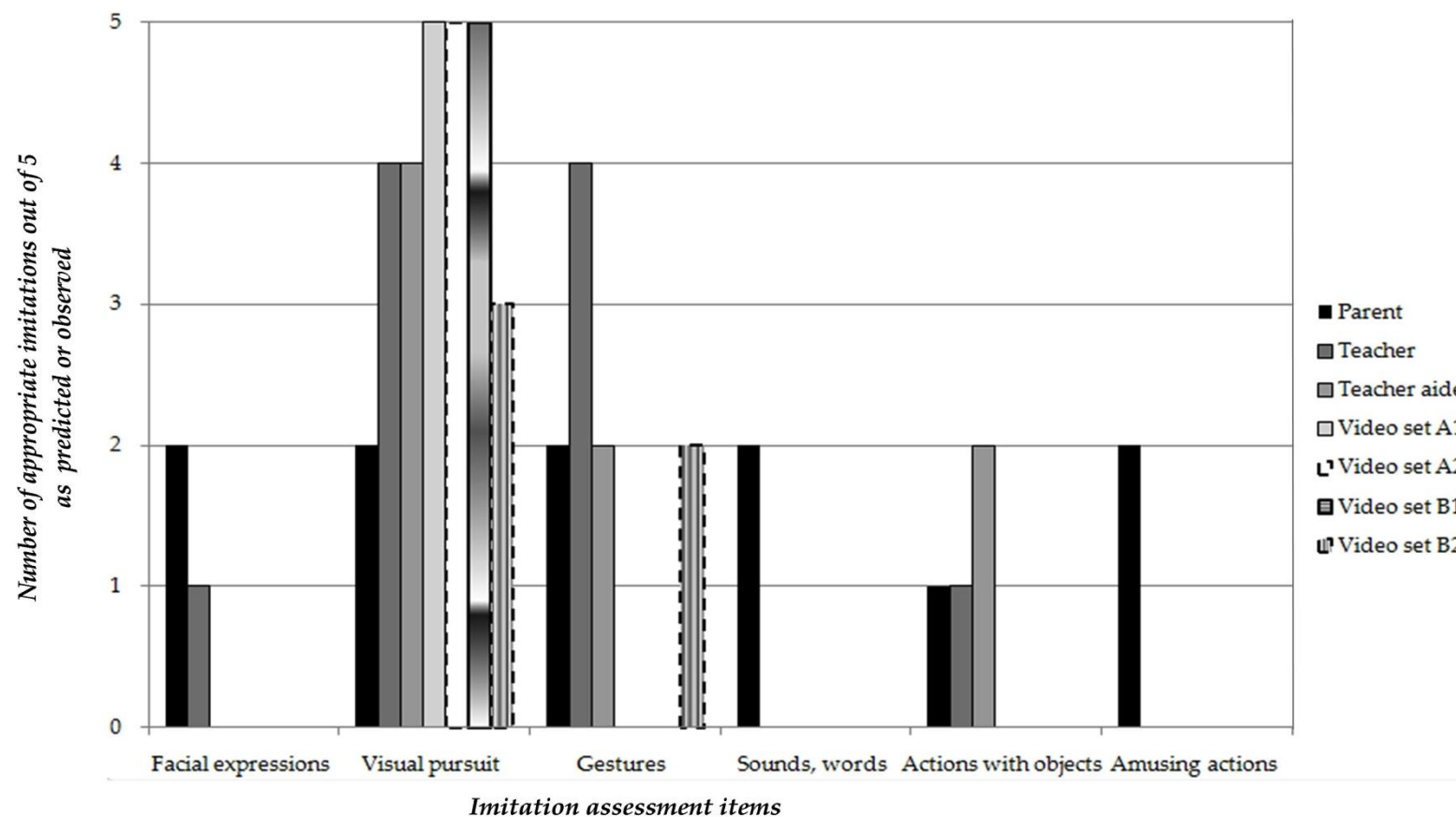


Figure 5-3. Matthew's predicted (interview-based) and observed (video-based) imitation assessment scores for items 1-6 from the Imitation Disorders Evaluation (IDE) of Malvy et al. (1999). 'Video set A' is the first video-based session and 'Video set B', is the second; the numbers 1 and 2 represent the first and second set of five opportunities within that session.

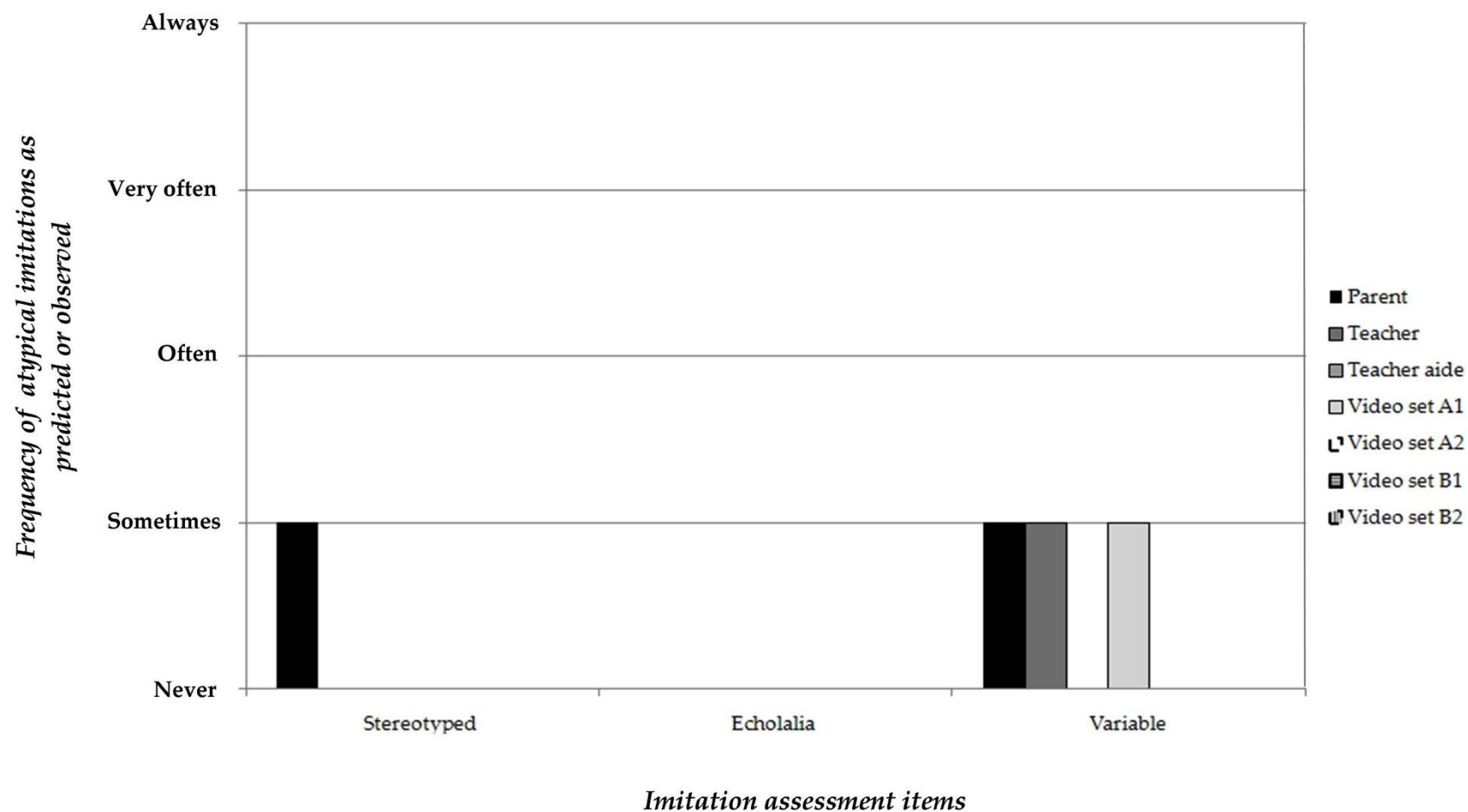


Figure 5-4. Matthew's predicted (interview-based) and observed (video-based) imitation assessment scores for items 7, 8, and 9 from the *Imitation Disorders Evaluation* (IDE) of Malvy et al. (1999).

Scores were quite consistent within and across the video-based imitation sessions, with a high of 100% agreement for exact scores across the second set of the first session (A2) and the first set of the second session (B1). In contrast, the level of agreement between the video-based sessions and the interview responses was comparatively low, particularly between the video-based sessions and the interview with Matthew's mother, where a low of 44% for agreement within one level was recorded when comparing scores from the parental interview with both the second set of the first video (A2) and the first set of the second video (B1). Overall average agreement within one level of the scale across sources assessing Matthew's imitative behaviour was 79% (see Table 5-2).

Table 5-2. Data showing agreement within one level for the assessment of Matthew's predicted (interview-based) and observed (video-based) imitation behaviour.

	Parent	Teacher	Teacher aide	Video set A1	Video set A2	Video set B1	Video set B2	Average agreement
Parent	NA	78%	67%	44%	44%	44%	67%	58%
Teacher	78%	NA	100%	89%	89%	89%	89%	89%
Teacher aide	67%	100%	NA	78%	78%	78%	89%	81%
Video set A1	44%	89%	78%	NA	100%	100%	89%	78%
Video set A2	44%	89%	78%	100%	NA	100%	89%	78%
Video set B1	44%	89%	78%	100%	100%	NA	89%	83%
Video set B2	67%	89%	89%	89%	89%	89%	NA	85%
Overall average agreement								80%

5.3.4 *Experimental design and target behaviours*

This study's design represented a combination of a multiple-baseline and an alternating treatments design (Cooper et al., 1987; Johnston & Pennypacker, 1980). Following the pre-baseline interviews and imitation assessments, the study analysed VM interventions for three target behaviours: (1) speaking appropriate words during circle time; (2) matching the six Australian coins with their respective pictures and written symbols; and (3) preparing a snack of noodles. Target behaviours 1 and 2 were directly related to goals described in Matthew's Individualised Education Plan (IEP) determined by his mother and his regular classroom teacher and all three target behaviours were chosen after consultation with them.

'Circle time' was the name given to the structured whole group discussions in Matthew's class. Circle time was a daily learning experience in Matthew's classroom, and was the only target behaviour of this study that was a part of his regular educational program prior to baseline. During this classroom routine, all students were seated in a circle in the separate learning space with the teacher positioned by a board for arranging and displaying laminated text labels and symbols. The teacher led the class in discussions on topics relating to their routine (with questions such as 'What have we done today?'), the class ('Who is here today?'), the day ('What day is it today?'), the weather ('What is the weather like today?') and other topics of interest. Although some variability in the topics of the discussions and the duration of circle time was evident, there was consistency with addressing the topics related to the nine questions in the videos produced for circle time.

5.3.5 Video production

Prior to baseline and intervention sessions, two videos were produced for each of the three target behaviours; one featuring Matthew's sibling and the other featuring the researcher, who was unfamiliar to Matthew prior to the study. Matthew's sibling was a typically developing 12 year-old boy, who volunteered to act as a model as well as to help with video recording and video editing. The same digital camera, software and laptop computer used in Study 1 (*Chapter 4*) was used in the production of the videos for the three target behaviours in this study with Matthew.

The videos speaking appropriate words during 'circle time' featured the model responding with an appropriate sentence to nine questions that were typically asked of students during this learning activity, in addition to an opening slide ('Hello Matthew! It's circle time!') and closing slide ('Good talking Matthew! Circle time is finished now!'). These included questions such as 'Who is here today?' and 'What day is it today?'; with responses such as 'I'm here today. My name is Chris', and 'It's Thursday today'. The video also showed the model arranging the Velcro label on the board appropriately, such as putting the label for Thursday next to the heading 'Today is'. The adult-as-model and sibling-as-model videos for the circle time target behaviour were 3 minutes 4 seconds and 2 minutes 47 seconds in duration respectively, and included the same script word for word.

The coin matching video was recorded using the third-person perspective for the opening ('Let's learn about coins!') and closing ('Let's go shopping!') sequence, but was recorded in first-person perspective for the main segment in which the coins were

identified and the matching of coins with their pictures and labels was modelled. The videos featured the same script, which included verbally identifying the coins as they were matched. Labelled photos of the coins were included in the video, as were close ups of the coins matched to their respective labels. The adult-as-model and sibling-as-model videos for the coin matching target behaviour were 1 minute 56 seconds and 1 minute 58 seconds in duration respectively.

The adult-as-model and sibling-as-model videos for preparing a snack of noodles were both 2 minutes and 31 seconds in duration. The videos featured a still picture of the noodle packet as a starting (and finishing) slide (see Figure 5-5). The opening sequence showed the model at Matthew's desk saying, 'I'm hungry. I'm going to make myself some noodles' before moving to the kitchen area. The video was recorded from the third-person perspective but varied in focus, with scenes such as walking to the kitchen area showing the whole model and scenes such as filling the container with water zooming in on the hands and container of the noodles in order to clearly portray the relevant steps. It included slides with text including 'Open the lid', 'Fill with water', 'Add the flavour', 'Wait', 'blow to cool it down' before the relevant steps. The video closed with the model at Matthew's desk saying 'Yum, Noodles!' and using a fork to begin eating the noodles.



Figure 5-5. Still images from the videos used for the preparing noodles task (top left and top right), coin matching task (bottom left), and the circle time target behaviour (bottom right).

5.3.6 Experimental conditions and data collection for circle time

5.3.6.1 Baseline and withdrawal conditions for circle time

Each circle time session, Matthew was seated in the same position, clockwise to the teacher and next to the same peer. The teacher, and the teacher aides, directed questions to individuals in the class by name and would provide Matthew with verbal praise for appropriate responses to questions or relevant statements, because increasing the frequency of appropriate verbal communication was a learning priority for Matthew. Because this protocol was established prior to the research, it was decided not to change

the contingent reinforcement in the form of praise, but to continue the protocol across all experimental conditions.

5.3.6.2 Video modelling conditions for circle time

The VM (intervention phase) sessions were conducted following the same procedure as for baseline and withdrawal sessions, as described above, except that Matthew was shown the video demonstrating appropriate verbal communication immediately prior to the commencement of circle time. The adult-as-model and sibling-as-model videos were presented on alternative sessions in the sequence Y X Y X Y X Y, where X represents the sibling-as-model video and Y represents the adult-as-model video.

5.3.6.3 Data collection for circle time

During baseline, all VM and withdrawal sessions, the regular classroom procedure (previously described) was observed by the researcher. The number of questions posed by the teacher and teacher aides to Matthew was recorded as was the number of appropriate recognisable words he spoke during circle time. The dependent variable was recorded as the number of words spoken divided by the number of questions asked. This measure provided some flexibility for staff in implementing the activity (in keeping with the applied setting) while minimising the effect of any variation in the number of questions posed and the duration of circle time. For example, this method would result in a higher score for the dependent variable in a session where ten appropriate words were spoken and 15 questions were asked (ratio of 2:3), than in a

session that where 20 words were spoken but 50 questions were asked (ratio of 2:5).

Also, a list of the specific words that Matthew used during each circle time session was kept so that both his imitation of the responses modelled in the videos and any generalisation of these conversation skills could be assessed.

5.3.7 Experimental conditions and data collection for coin matching

5.3.7.1 Baseline conditions for coin matching

At the beginning of each session, Matthew was asked whether he would like to participate in this activity with the coins. Sessions were only initiated if Matthew was willing to participate and were terminated if he demonstrated an unwillingness to participate during the session. This was an important consideration ethically, because although learning to recognise the coins was identified in Matthew's IEP, the activity described here was exclusive to this research and had not been implemented in his normal classroom learning experiences. Matthew was seated at his desk and a laminated sheet with labels and pictures of the six current Australian coins was placed in front of him (see Figure 5-6).



Figure 5-6. Scanned image of coin matching tables, with Australian coin pictures (left) and without pictures (right) as used in this study - actual tables were approximately A5 size.

Each of the six current Australian coins was presented to Matthew in a random order to ensure that he was actually recognising the coins, not simply repeating a set sequence of behaviours. The order was determined by the roll of a dice, with the six numbers of the dice representing the six coins: 1 = 5c, 2 = 10c, 3 = 20c, 4 = 50c, 5 = \$1 and 6 = \$2. The researcher would then ask Matthew, 'What coin is it?' and allow 10 seconds for him to look at the coin and place it in the appropriate row. If Matthew became distracted, the researcher would repeat the question with similar statements, such as 'Can you show me?' or 'Where does this coin go?' This sequence was repeated for the

sheet with pictures (making twelve opportunities) and the same procedure was followed for the sheet without pictures to determine if Matthew had associated the coin with its numerically written label. This represented a total of 24 coin matching opportunities including both sheets. Matthew was offered a jelly-bean for participating after the first sheet with pictures and was offered two jelly-beans for participating after the second sheet without pictures regardless of whether he matched the coins correctly or not. No correction or reinforcement was provided contingent upon correctly matching the coins during baseline sessions. This reinforcement for participation (non-contingent for correct performance) was included because it was a strategy in use by the regular classroom teacher to promote Matthew's compliance with undertaking academic tasks, yet it was preferable to avoid this reinforcement becoming part of the independent variable.

5.3.7.2 Video modelling conditions for coin matching

The VM (intervention phase) sessions were conducted using the same procedure as baseline, except that prior to presenting Matthew with the coins he was shown the video which included labelled pictures of the coins and the model successfully completing the coin matching task (starting with 5c through to \$2). The two videos were presented on alternative sessions in the sequence X Y X Y X Y X Y, where X represents the sibling-as-model video and Y represents the adult-as-model video.

5.3.7.3 Withdrawal session conditions for coin matching

Data was recorded for only one session of withdrawal, due to Matthew declining to participate on a number of occasions. For the coin matching task, the procedures for

the withdrawal were the same as baseline (no video presented), except that an error correction protocol was followed. If Matthew placed a coin incorrectly on the sheet (that is, on any row other than the one with the corresponding label), the researcher would take the coin off the sheet saying 'That's not where this coin goes'. Then the researcher would correctly match the coin, saying 'This is (name of coin), it goes here' and prompt Matthew to copy the correct response. Only the responses in which Matthew correctly matched the coin the first time (without the researcher providing error correction) were recorded as correct.

5.3.7.4 Data collection for coin matching

For each of the 24 opportunities, the researcher recorded whether or not Matthew correctly placed the coin in row with the relevant label. The percentage of correctly matched coins (dependent variable) was calculated for each session by dividing the number of correct responses (maximum 24) by the number of opportunities (maximum 24). This allowed continuity in the data when Matthew withdrew his participation prior to finishing the whole task. In session number six, 20 opportunities were provided, and in session seven, only ten opportunities were provided. For all other sessions, 24 coin matching opportunities were provided.

5.3.8 Experimental conditions and data collection for preparing noodles

5.3.8.1 Baseline and withdrawal conditions for preparing noodles

Baseline and withdrawal sessions were conducted at morning tea time (approximately 10am) with Matthew seated at his desk. The researcher would show Matthew a laminated card with the picture of the noodle container as depicted in Figure 5-3 and the word 'Noodles' in text and say, 'Let's make some noodles!' Matthew would then be given an opportunity to perform the steps for the preparation of noodles as described in Table 5-3.

If Matthew did not initiate a step in the sequence after ten seconds, the researcher would provide a verbal prompt such as, 'Let's make noodles' or 'What do we have to do?' These prompts did not give specific directions or describe the relevant step, but were intended to refocus Matthew's attention on the task. If Matthew did not perform a step within ten seconds after the verbal prompt, the researcher would complete the step for him; this was done quickly and without drawing attention to the researcher's performance of the step. It was possible for Matthew to observe the researcher completing the steps he himself did not complete. It was important that whether or not Matthew completed each step, he was able to eat properly prepared noodles for morning tea. With this in mind, the only exception to the prompting and completion of steps provided by the researcher was for steps 9 and 11 – no prompting was provided neither were these steps completed by the researcher regardless of Matthew's participation.

Table 5-3. Task analysis for preparing noodles as used in this study

Step No.	Step description
1	Retrieve the noodle container from the cupboard
2	Open the noodle container's lid
3	Take out the flavour sachets from the packet
4	Fill the noodle container with water
5	Put the flavour in the noodle container (using scissors to cut the flavour sachets was performed by the researcher*)
6	Put the noodle container in the microwave (setting the microwave cooking time and power was performed by the researcher*)
7	Once the noodles have been cooked for 2 minutes, take the container out of microwave
8	Close the microwave door
9	Stir the noodles
10	Take the noodles to the table
11	Blow the noodles to cool them down appropriately before eating them

** Following discussion with family and school staff, it was decided that assistance should be provided with these steps because they were potentially dangerous and involved a level of fine motor coordination that Matthew did not yet possess.*

5.3.8.2 Video modelling conditions for preparing noodles

VM (intervention sessions) were conducted using the same procedure as in the baseline and withdrawal phases, except that a video demonstrating the preparation of the noodles was presented to Matthew at his desk prior to giving him an opportunity to perform the target behaviour himself. The sibling-as-model and adult-as-model videos were presented on alternative sessions in the sequence X Y X Y X Y X, where X represents the sibling-as-model video and Y represents the adult-as-model video.

5.3.9 Data collection

The number of steps Matthew performed (whether before or after the verbal prompt) was recorded for each session. The number of steps completed was divided by the total number of steps in the task analysis (11) to provide a percentage of steps completed (dependent variable).

5.3.10 Reliability measures

Inter-observer agreement (IOA) and treatment fidelity (TF) data for this study were collected for one coin matching session, with percentages of 96% and 100% respectively. Data for IOA were collected in three preparing noodles sessions, with 100%, 91% and 100% agreement recorded. Also, TF data were collected in one preparing noodles session with a score of 100% recorded. TF was assessed by having a second observer complete a checklist which summarised the procedures in steps for the relevant conditions, as described above. Although the scores recorded for IOA and TF were high, it should be acknowledged that the limited number of occasions for which these data are reported may be seen as a limitation in terms of the internal reliability of the data in this study (Campbell & Stanley, 1966; Wilczynski et al., 2008).

5.4 Results

5.4.1 *Circle time*

The data presented in Figure 5-7 do not preclude the possibility that VM had an effect on the ratio of appropriate words spoken by Matthew to the number of questions directed to him, but no clear, positive intervention effect was observed. The data for sessions in the baseline phase for circle time was characterised by variation, notably the high of 0.9 and the low of 0 for sessions 6 and 7 respectively. While there were some numerical differences in the averages for the experimental phases (baseline average 0.37; VM average 0.54; withdrawal average 0.34), the variability of the data and the overlap of data-points argue against a functional relationship between the intervention and the target behaviour within the period of this study. Similarly, although scores were numerically higher for the adult-as-model (average 0.62) than the sibling-as-model (average 0.44) the VM interventions did not clearly affect Matthew's performance of the target behaviour. Furthermore, the data did not indicate clearly the efficacy of one of these intervention approaches over the other. Of the 61 different words used by Matthew as recorded over the period of the study, the only modelled responses to questions that featured in the video that he used were the words 'Thursday' and 'Circle time'.

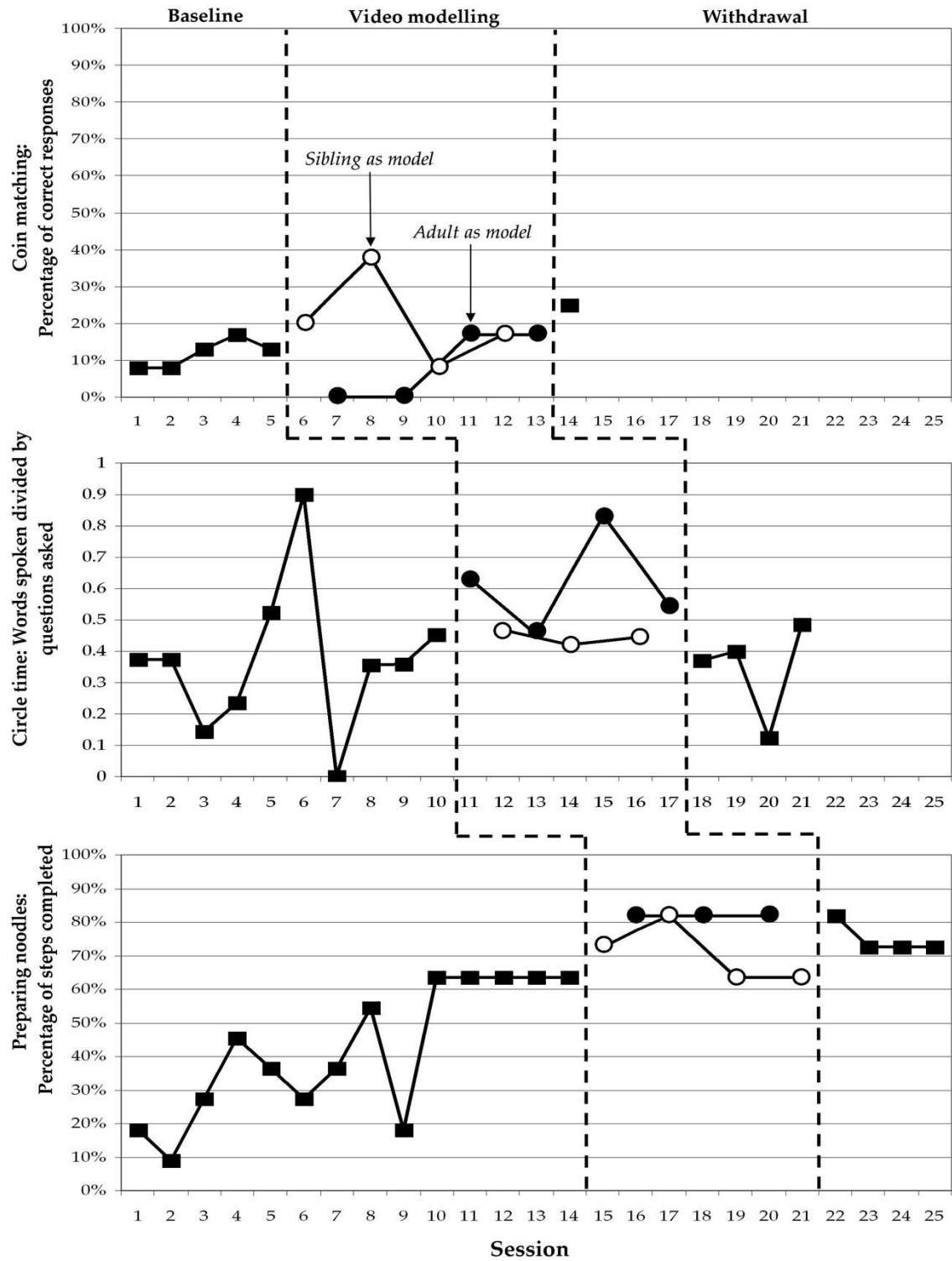


Figure 5-7. Graphs showing Matthew's performance across all phases for the three target behaviours.

5.4.2 *Coin matching*

There was some variation in performance across sessions in the VM phase, but Matthew's ability to correctly match the coins did not improve as a result of the VM intervention (see Figure 5-7). Low percentages of correct responses were consistently recorded for baseline, ranging from 8% to 17% correctly matched coins, with an average of 12% for the baseline phase. Scores ranged from a low of 0% to a high of 38% during the VM phase, with an average of 15% across the eight sessions. While averages of 21% and 8% correctly matched coins were recorded in the sibling-as-model and adult-as-model conditions, the visual inspection of the data suggested that there was no clear difference between data paths for the independent variables, with considerable overlap of data points. Furthermore, assuming that there was a one-in-six chance of correctly matching each coin and that 17% correctly matched coins could be anticipated based solely on chance, neither of these conditions seemed to have positively affected Matthew's performance of this target behaviour.

5.4.3 *Preparing noodles*

The data path for preparing noodles suggests that an increase in Matthew's independence with this target behaviour occurred over the course of this study (see Figure 5-7). However, the increasing completion of steps indicated by the data is evident in the baseline phase, and not exclusively to the VM phase. After a low of 9% (1 step out of 11) completed in session 2, Matthew's performance stabilized at 64% (7 steps out of 11) across sessions 10 to 14. Matthew completed a high of 82% (9 steps out of 11) in the

adult-as-model condition (sessions 16, 18 and 20), the sibling-as-model condition (session 17) and the withdrawal condition (session 22). While Matthew completed more steps in the VM conditions and withdrawal than in baseline, the only two steps which he did not complete in any baseline session (stirring the noodles and blowing the noodles to cool them down) were the same two steps which Matthew did not complete in any VM or withdrawal session. Although Matthew completed more steps during the adult-as-model sessions (82%) than the average of those for the sibling-as-model condition (70%), with only seven sessions across both these sessions the limited difference between these conditions does not clearly demonstrate the effectiveness of the adult-as-model condition in comparison to the sibling-as-model condition.

5.4.4 Social validity

Matthew's regular teacher was on leave during the baseline, intervention, and withdrawal phases of the study. The teacher who was present during this time provided feedback on the study regarding its social validity and considered that Matthew's ability to speak in circle time was an 'extremely important' skill. He suggested that Matthew could participate in 'few aspects independently' of circle time. In response to the question 'Do you think that your student has found learning from video models in this study to be enjoyable?', he answered 'neutral'. He described the ability to recognise coins as being a 'not very important' skill for Matthew, and provided the same responses to the last two questions for the coin matching as for the circle time target behaviour. From anecdotal observations, including the fact that Matthew sometimes

declined to participate, it was apparent that he did not like participating in the coin matching task, although he did not object to watching the videos.

The teacher considered making noodles to be a 'quite important' skill for Matthew, that Matthew learnt to complete 'some aspects independently' and that Matthew found learning this skill from video models in this study to be 'enjoyable.' The teacher also added that, 'Matthew seemed to enjoy this activity most of the time. He was also interested in looking at the video when we showed it to him (after the study).' Consistent with this observation, when the researcher arrived at the classroom, Matthew would often point to computer laptop bag and say 'video', indicating that he would like to have the researcher present the videos to him. According to a teacher aide in Matthew's classroom, he would ask after the researcher and the videos in the weeks following the withdrawal phase of the study.

A video depicting Matthew completing the preparation of noodles successfully was produced which incorporated footage taken from Matthew's performance in session 23. In line with the suggestions made in *Chapter 2* regarding the utility of video self-modelling, a copy of this edited video was given to Matthew's parents and Matthew's teacher. The video provided a record of what Matthew had learnt and could serve as a teaching resource if he needed support in performing this task in the future.

5.5 Discussion

5.5.1 *Imitation and the effectiveness of VM*

The VM intervention described in this second study did not lead to clear improvements in Matthew's performance of the circle time or coin matching circle time target behaviours; nor could his increased independence in the preparation of noodles be attributed to the VM intervention procedures. Because the imitation assessments were conducted while his regular teacher was on duty with minimal imitative responses, it would be unreasonable to attribute Matthew's limited response to the interventions to the presence of a different teacher. The results of the imitation assessment could be used to explain why VM was not the most suitable intervention approach for Matthew. The results of the video-based imitation assessment indicated that Matthew did not readily respond to imitation opportunities presented via video. The finding that VM did not lead to gains in Matthew's performance of the target behaviours supports the hypothesis that imitation skills are an important prerequisite skill for participants of VM interventions (MacDonald et al., 2005; McCoy & Hermansen, 2007; Norman et al., 2001).

The findings of the present study regarding imitation skills being prerequisites for effective VBI are strengthened when considered together with findings of the previous study with Regan (*Chapter 4*). According to their CARS assessment scores, Regan and Matthew had the same level of autistic impairment, both scoring 38.5, which placed them in the 'severely autistic' range. They also had similar adaptive behaviour

profiles based on their VABS assessments, with Matthew having a slightly higher overall developmental age equivalent (3 years 8 months) than Regan (2 years 9 months). Regan demonstrated stronger imitation skills than Matthew based on the imitation assessment procedures conducted as part of the two studies. The contrast in the two participants' imitative behaviour is clearly evident when comparing Regan's and Matthew's scores for items 3 (gestures), 5 (actions with objects) and 6 (amusing actions). Thus, the assessments showed differences in these two participants' imitation skills, and it would be reasonable to suggest that these differences may have influenced the relative success of the respective interventions.

The differences in target behaviours across the two case studies limit direct comparisons of the effectiveness of the VM interventions for the participant of the present study with that of *Chapter 4*. It could be argued that the differences in target behaviours, rather than (or in addition to) the characteristics of the participants, could account for the difference in the reported effectiveness of the respective interventions. The behaviours targeted for Regan involved chained sequences of steps, as was Matthew's preparation of noodles. But the sequence of questions and answers for the circle time conversations, while following a predictable pattern, were not strictly chained – that is, the sequence did not consist of connected steps, where all steps are inter-related as part of the whole (Schuster & Griffen, 1993). Previous studies have found VM to be effective for teaching chained behaviours (Sigafoos et al., 2005), and conversation skills (Sherer et al., 2001), but few have targeted academic skills such as the coin matching task of this study for students with autism (Rayner et al., 2009).

The coin matching task was not a chained sequence of behaviours. The order in which the coins were presented to Matthew was randomly determined. This was important because demonstrating the ability to recognise the coins, rather than just being able to imitate the modelled performance of the matching activity, was the desired outcome. In the videos presented to Matthew the coins were presented and matched in order of value from smallest (5 cents) to largest (\$2), which was from the bottom to the top of the sheet. Matthew was never observed following or imitating this same order. In fact, on several occasions Matthew was observed putting the coins from the top to the bottom of the sheet, regardless of the value of the coin. These anecdotal observations suggest that, in addition to not matching the coins correctly according to their appearance (and value), Matthew did not imitate the sequence performed by the video models.

Regan's acquisition and possible generalisation of one target behaviour (unpacking his bag) and acquisition of some steps in the second target behaviour (tooth brushing) compared with the limited effect of the VM intervention on Matthew's acquisition of all three target behaviours suggests that Matthew was less suited to VBI than was Regan. Furthermore, in terms of participant characteristics, their imitation ability (as measured by the video-based assessment) differentiated these two participants more clearly than their chronological age, their developmental age equivalent (as measured by the VABS), or the severity of their autistic impairment (as measured by the CARS). As with the study involving Regan, low levels of agreement across the data sources regarding Matthew's imitation were recorded; in Matthew's case levels of agreement between scores from the parent interview and the observed video-

based imitation assessment were particularly low. Again, this finding may be used to support the use of the latter imitation assessment procedure conducted in the same context as the proposed intervention, rather than the use of assessments conducted by interview.

Suggesting that Regan was more suited to VBI than Matthew does not necessarily mean that Regan would be more receptive to other teaching approaches than Matthew. Indeed, Matthew seemed to respond to the prompting and live modelling opportunities of baseline sessions for the preparing noodles task with an increase in steps completed. In comparison, a lack of response on Regan's part to respond to similar teaching approaches in baseline phases was evident for his target behaviours. It is important to note that preparing noodles was a highly motivating task for Matthew, and as a variable, motivation may have influenced the results of this study as much (or more) than the choice between different evidence-based intervention procedures for the three target behaviours. Previous research has suggested that for some participants, reinforcement histories and motivation to perform the target behaviours can have an influence on the effectiveness of video self-modelling and self-observation interventions (Clark et al., 1993; McCurdy & Shapiro, 1988). It would be reasonable to suppose that this finding would be relevant to other forms of VBI.

5.5.2 Comparison of model types

This study found no clear or consistent differences between the effectiveness of animated versus real (human adult) models as indicated by Matthew's responses to the

videos presented as part of the imitation assessment. There is the possibility that any differences between the effectiveness of these model types were hidden by Matthew's limited imitation responses overall. Some differences in Matthew's performance were recorded between adult-as-model and sibling-as-model conditions within the three target behaviours, but these conditions did not result in clear differences in his performance of the target behaviours. Any difference between the model types was not consistent across the target behaviours, with the sibling-as-model associated with slightly stronger performances in one target behaviour (coin matching) but adult-as-model associated with slightly stronger performances of the other two target behaviours (circle time and preparing noodles). The finding that neither model type was more effective than the other is consistent with other research comparing self-as-model and peer-as-model (Schunk & Hanson, 1989; Sherer et al., 2001), as well as siblings, peers and adults (Jones & Schwartz, 2004).

5.5.3 Directions for future practice and research

While previous studies have suggested that imitation is a pre-requisite skill for participants being able to benefit from VM (McCoy & Hermansen, 2007), this case study is among the first to document the limited effectiveness of VM for a participant formally assessed to have limited imitation skills. There are both practical and theoretical reasons to support the use of methods to assess participant's prerequisite skills such as imitation in conjunction with the implementation of VBI. The video-based imitation assessment used in this study, as well as in the study described in *Chapter 4* (as in Rayner, 2010) has the advantage of assessing not only the participant's ability to attend to the video, as in

the assessment used by Nikopoulos and Keenan (2003, 2004a, 2006), but also the frequency with which they imitate behaviours presented by video. Also, being based on the IDE, a wider range of imitative behaviours can be assessed using this procedure than by measures such as the *Motor Imitation Scale* (Stone et al., 1997) as used by Hine and Wolery (2006). Therefore, practitioners may benefit from the use of an assessment protocol similar to the one used in this study to evaluate whether or not VM is a suitable intervention approach for a particular individual with autism. While the relationship between imitation ability as assessed by the procedures described in this study and VBI effectiveness remains to be more conclusively demonstrated by further research, findings from both the previous case study with Regan (*Chapter 4*) as well as the present case study with Matthew are consistent with the hypothesis that a participant's imitation skills are an important prerequisite for successful VBI.

Although no clear or consistent differences in the effectiveness of an animated model or a sibling model compared with an adult model were found in Study 2, future research may indeed indicate whether individuals with autism learn more effectively from these model types. Addressing methodological limitations apparent in the present study would strengthen the conclusions of future studies regarding these questions. These issues included the lack of inter-observer agreement and treatment fidelity data, as well as the short intervention phases, which limit the internal reliability and conclusiveness of interpretations made from the data (Campbell & Stanley, 1966). The short intervention phases may have limited the ability to compare the relative efficacy of the two modelling conditions. While it could be argued that the length of the phases also provided a limited opportunity for the participant to acquire the target behaviours,

other VM interventions have reported positive outcomes within several sessions (Charlop-Christy et al., 2000; Dowrick & Raeburn, 1995; Rayner, 2010).

Until strong contrary evidence is provided by research, practitioners' choice of model type should be based upon consideration of the time, availability of models, and cost effectiveness of producing videos of the potential models (Apple et al., 2005; Ayres & Langone, 2005), together with the possible social benefits experienced by the models (Reagon et al., 2006). This recommendation is based on the general finding to date that no model type has consistently been found superior to others across VBI studies for individuals with autism (see *Chapter 2*). Another consideration is the degree to which the participant is motivated to perform the task. This study (Study 2) included a target behaviour which the participant was quite motivated to perform (preparing noodles) as well as a target behaviour which he was clearly not motivated to perform (matching coins). While the issue of motivation is not specific to VBI, it certainly influences the outcome of VBI. Researchers and practitioners should consider how the tasks students are required to learn can be designed to motivate participation and embed such strategies within their VBI procedures.

Chapter 6 - Study 3: Teaching Students with Autism to Tie a Shoelace Knot Using Video Prompting and Backward Chaining

6.1 Overview

Video-based intervention (VBI) procedures have been used to teach a variety of daily living skills to individuals with autism and other developmental disabilities. This study evaluated the effects of video prompting (VP) and backward chaining for teaching three boys with autism to tie a shoelace knot. While the VP interventions increased the number of steps completed by each of the participants, the introduction of a backward chaining procedure enabled one participant to reach mastery, and a second participant to approach mastery. The third participant completed more steps of the target behaviour during the backward chaining condition than baseline and VP conditions, but did not make progress towards mastery of the target behaviour. The results are discussed in relation to the participants' imitation abilities and level of adaptive behaviour, the types of models and resources used, as well as the implications for future practice and research.

6.2 Introduction

Individuals with developmental disabilities such as autism often experience difficulty with learning daily living skills and in functioning independently (American Psychiatric Association, 2000; Cannella et al., 2006; Shipley-Benamou et al., 2002; Sigafos et al., 2005). Thus there is a need to identify evidence-based educational intervention approaches suitable for this cohort (Green et al., 2006a; Roberts & Prior,

2006). Recent research has highlighted the potential of VBI for teaching individuals with autism (Rayner et al., 2009). Based on findings from their meta-analysis of VM and video self-modelling studies, Bellini and Akullian (2007) concluded that these forms of VBI should be described as evidence-based practices for children and adolescents with autism. Specifically, the greatest mean intervention effect across the 23 studies was for functional behaviours (self-help and purchasing skills) (Bellini & Akullian, 2007). In addition to the eight studies included in their meta-analysis, a number of studies have investigated the use of VBI for teaching daily living skills to individuals with disabilities (see Table 6-1).

Table 6-1. Daily living skills targeted for individuals with developmental disabilities through a video-based intervention.

Target behaviour		Reference
1	Banking	Cihak et al. (2006)
2	Brushing teeth	Charlop-Christy et al. (2000)
3	Cashing a cheque	Branham et al. (1999)
4	Cleaning a fish bowl	Shipley-Benamou et al. (2002)
5	Cleaning sunglasses	Norman et al. (2001)
6	Cooking skills	Graves, Collins, Schuster, & Kleinert (2005)
7	Crossing a street	Branham et al. (1999)
8	Dishwashing	Sigafoos et al. (2007b)
9	Feeding a cat	Shipley-Benamou et al. (2002)
10	Fire safety	Tiong, Blampied, & le Grice (1992)
11	Grocery store word recognition	Kyhl et al. (1999)
12	Hand washing	Hagiwara & Myles (1999)
13	Laundry – putting shirts on a hanger and hanging in closet	Lasater & Brady (1995)
14	Mailing a letter	Branham et al. (1999)
		Shipley-Benamou et al. (2002)
15	Making and serving a cup of coffee	Bidwell & Rehfeldt (2004)
16	Making orange juice	Shipley-Benamou et al. (2002)
17	Microwave oven popcorn preparation	Sigafoos et al. (2005)
18	Personal computer use	Le Grice & Blampied (1994)
19	Purchasing / shopping related skills	Alcantara (1994)
		Ayres & Langone (2002)
		Cihak et al. (2006)
		Haring et al. (1995)
		Haring et al. (1987)
		Mechling & Gast (2003)
		Mechling (2004)

Target behaviour		Reference
		Mechling et al. (2003)
		Mechling et al. (2002)
		Mechling et al. (2005)
20	Putting away groceries	Cannella et al. (2006)
21	Putting on wrist watch	Norman et al. (2001)
22	Sandwich making - peanut butter and jelly sandwich	Lasater & Brady (1995)
		Rehfeldt, Dahman, Young, Cherry, & Davis (2003)
23	Setting a table	Cannella et al. (2006)
		Goodson, Sigafos, O' Reilly, Cannella, & Lancioni (2007)
		Shipley-Benamou et al. (2002)
24	Shaving (safety razor and electric razor)	Lasater & Brady (1995)
25	Toilet use	Keen et al. (2007)
26	Video recorder use	Le Grice & Blampied (1997)
27	Vocational skills	Cihak, Kessler, & Alberto (2007)
		Mechling & Ortega-Hurndon (2007)
28	Washing face	Charlop-Christy et al. (2000)
29	Zippping up jacket	Norman et al. (2001)

Questions regarding the effective implementation of VBI still remain, as few comparative studies have been published (Rayner et al., 2009). One such question relates to being able to predict who would benefit from VBI. According to McCoy and Hermansen (2007), although imitation and attention abilities are considered to prerequisite skills, few VBI studies have assessed and reported on their participants' imitation or assessment abilities. A second question relates to the type of model used in the video. While some researchers have suggested that self-as-model procedures are

more effective than those with adult models (Cihak & Schrader, 2008), other researchers have found no consistent difference between self-as-model and peer-as-model procedures (Sherer et al., 2001).

A third question relates to the use of VBI in conjunction with and/or in comparison with other forms of intervention. In one study, static picture prompting was seen to be as effective as VP (Cihak et al., 2006). Approaches such as self-management (Apple et al., 2005) and live or 'in-vivo' modelling (Alcantara, 1994) have also been found to support and enhance interventions with a VM component. The comparative study of Charlop-Christy, et al. (2000) demonstrated that VM was more effective than live modelling for children with autism in terms of skill acquisition and generalisation, as well as being more economical overall. Notwithstanding, further research comparing VBI procedures with other forms of intervention would enable practitioners to make more informed decisions regarding the choice of intervention for a particular context.

Tying shoelaces has been successfully targeted using a backward chaining procedure for a youth with autism (Sadlier, Dixon, & Moore, 1992). By definition, backward chaining is a procedure in which the participant (or student) completes the last step of the behaviour chain first. This approach enables the participant to receive the reinforcement associated with completing the target behaviour before they have been able to perform the whole sequence independently (Alberto & Troutman, 2006; Cooper et al., 1987). This study investigated the efficacy of VP to teach three boys with autism to tie a shoelace knot. With the pragmatic introduction of an procedure based on the concept of backward chaining, this study (Study 3) enabled a comparison between the

effectiveness of the VP and the backward chaining procedures to teach the participants to tie a shoelace.

Following from the previous two intervention studies of this thesis (*Chapter 4* and *Chapter 5*), the current study provided a third opportunity to investigate the use of an imitation assessment procedure in connection with a VBI. Unlike studies of the previous two chapters, Study 3 involved three participants and thus enabled a within-study analysis of the relationship between imitation ability and intervention effectiveness. By incorporating peers, a sibling, and an adult as model, Study 3 also enabled a comparison of the effectiveness of peer and sibling models with the effectiveness of an adult model in a VBI for children with autism.

6.3 Method

6.3.1 Participants

6.3.1.1 Nick

Nick was ten years old at the time of Study 3. Nick was enrolled at a mainstream government primary school in southern Tasmania. The majority of his school time was spent in his grade five classroom. Nick had access to the support of a teacher aide for approximately 50% of the school week. Based on an interview with Nick's parents and observations by the researcher, Nick scored 31 on the *Childhood Autism Rating Scale* (CARS) (Schopler et al., 1988), which placed him in the 'mildly to moderately autistic' range. Based on scores from the *Vineland Adaptive Behaviour Scales* (VABS) (Sparrow et

al., 2005a, 2005b), Nick had an adaptive behaviour age equivalent of six years and three months (see Table 6-2 and Figure 6-1). Nick's interests included computing, creative writing, cooking, and bushwalking.

6.3.1.2 Kayden

Kayden was nine years old at the time of Study 3 and was part of a grade three classroom at the same school as Nick. Like Nick, Kayden had access to the support of a teacher aide for approximately 50% of the school week and both of these students accessed a specialised support program outside their classroom for at least 30 minutes of each school day. Based on an interview with Kayden's parents and observations by the researcher, Kayden scored 32.5 on the CARS (Schopler et al., 1988), which placed him in the 'mildly to moderately autistic' range. Based on scores from the VABS (Sparrow et al., 2005a, 2005b), Kayden had an adaptive behaviour age equivalent of six years and two months (see Figure 6-1 and Table 6-2). Kayden demonstrated an age-appropriate ability in spelling and his interests included playing with friends, watching DVDs and going on daytrips into the city.

Table 6-2. Summary of the participants' Vineland Adaptive Behavior Scale (VABS) profiles and *Childhood Autism Rating Scale* (CARS) scores.

Domain	Sub-domain	Age equivalents					
		Nick		Kayden		Sean	
		Years	Months	Years	Months	Years	Months
Communication skills	Receptive	6	6	5	6	5	0
	Expressive	5	7	4	5	2	3
	Written	5	1	9	10	6	9
Daily living skills	Personal	5	0	3	6	5	5
	Domestic	7	7	6	5	2	6
	Community	10	6	8	5	4	6
Social skills	Interpersonal relationships	3	2	7	10	6	9
	Play and leisure time	5	4	8	3	1	9
	Coping skills	10	6	5	7	2	9
Motor skills	Gross	3	11	2	9	2	10
	Fine	5	2	5	1	4	11
Average		6 years and 3 months		6 years and 2 months		4 years and 1 month	
CARS score (autistic impairment)		31 (mild-moderate)		32.5 (mild-moderate)		38.5 (severe)	

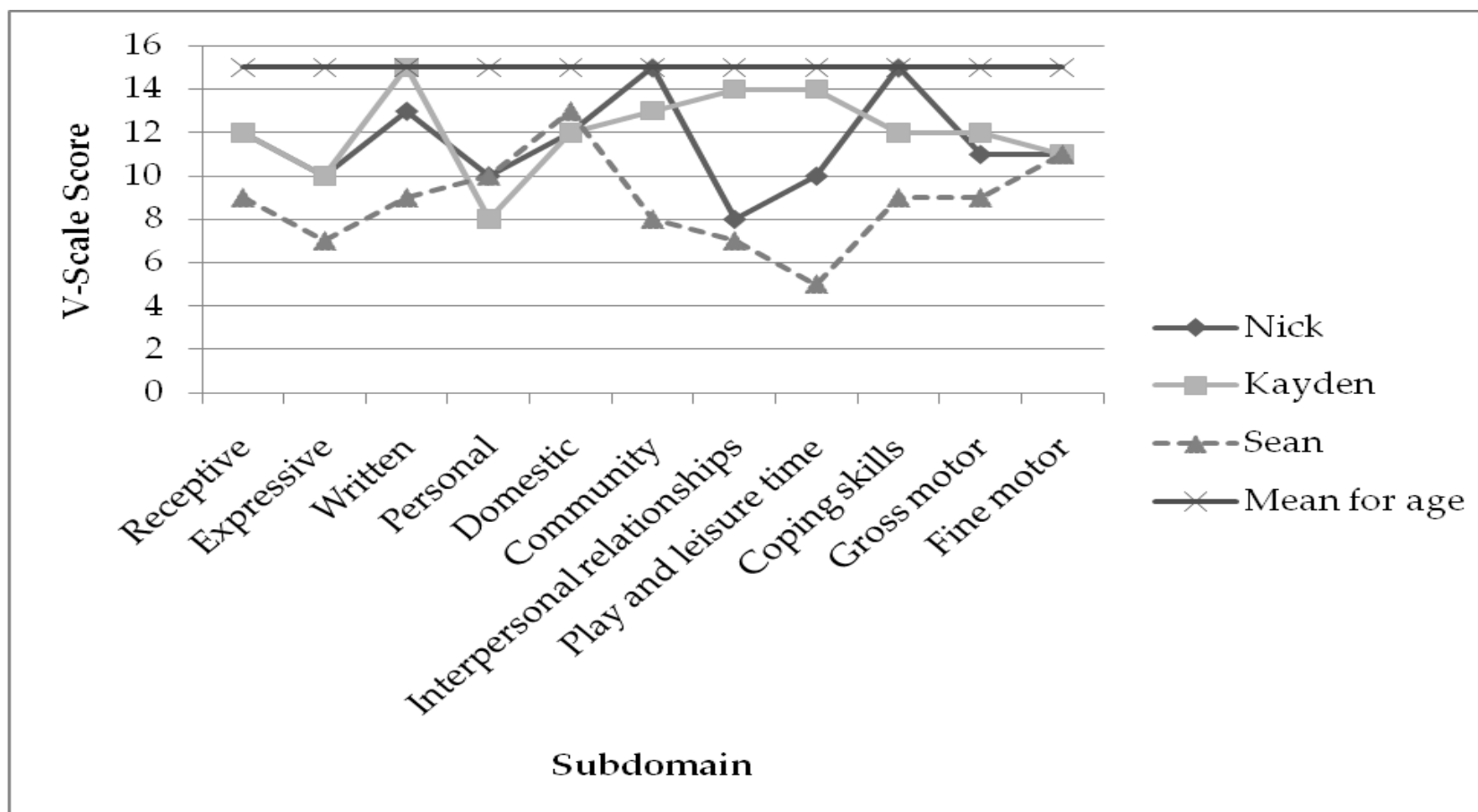


Figure 6-1. Graph comparing the V-Scale scores of Nick, Kayden and Sean across each subdomain of the *Vineland Adaptive Behaviour Scales* (Sparrow et al., 2005a).

6.3.1.3 Sean

Sean was ten years old at the time of the study and was part of a grade four classroom at the same school as both Nick and Kayden. Sean was supported for 100% of the school week by a teacher aide. At the time of the study, Sean was participating in an individualised program within the school as an alternative to participating in his regular classroom and was supported by two teacher aides. Based on an interview with Sean's parents and observations by the researcher, Sean scored 38.5 on the CARS (Schopler et al., 1988), which placed him in the 'severely autistic' range. Based on scores from the VABS (Sparrow et al., 2005a, 2005b), Sean had an adaptive behaviour age equivalent of four years and one month (see Figure 6-1 and Table 6-2). Sean enjoyed listening to music on his MP3 player, using computers, swimming, and going for walks to the beach.

6.3.2 Imitation assessments

The three participants' imitation skills were assessed using the same protocol as described in *Chapter 4* and *Chapter 5* of this thesis. This imitation assessment involved a nine question interview with the students' parents, their teachers and teacher aides who works with them. It also involved a video-based imitation assessment where their imitative responses to a series of behaviours were observed. Both the interview-based and video-based modes of the imitation assessment were informed by the *Imitation Disorders Evaluation (IDE) Scale* of Malvy et al. (1999). Each assessment was based on a maximum score of 30, representing 30 appropriate imitation opportunities – five opportunities for each of the first six items of the IDE. Both the interview-based and

video-based assessments also assessed the participants' imitation in relation to the atypical imitation items: stereotyped imitation (item 7), echolalia (item 8), and variable imitation (item 9). As with the study described in *Chapter 5*, the participants' responses to 12 behaviours performed by an animated model compared with a human model were also observed as part of the video-based imitation assessment.

Nick, Kayden, and Sean all successfully demonstrated the ability to imitate. Nick and Kayden successfully imitated 100% of behaviours modelled in the video-based imitation assessment. This included appropriate imitative responses to all 30 opportunities in video set 1 and video set 2, as well as all 12 opportunities in the animated model and comparable human model sequences (see Figure 6-2). Sean scored slightly lower than Nick and Kayden in all imitation assessment conditions, with a high of 83% of appropriate imitations recorded for both sets of the video-based imitation assessment. He also had higher scores for items 7-9 of the IDE, which suggested greater imitation abnormalities than Nick and Kayden (see Figure 6-3). Sean performed eight and seven appropriate imitative responses out of 12 for the comparative human and animated model sequences respectively. Scores from the interview-based assessments were generally lower than scores from the observed video-based assessment, with the lowest scores of 65% for Nick (teacher interview), 68% for Kayden (parent and teacher interview), and 50% for Sean (teacher interview). A number of interview respondents indicated that they had difficulty interpreting and responding to the questions corresponding to items 7, 8 and 9.

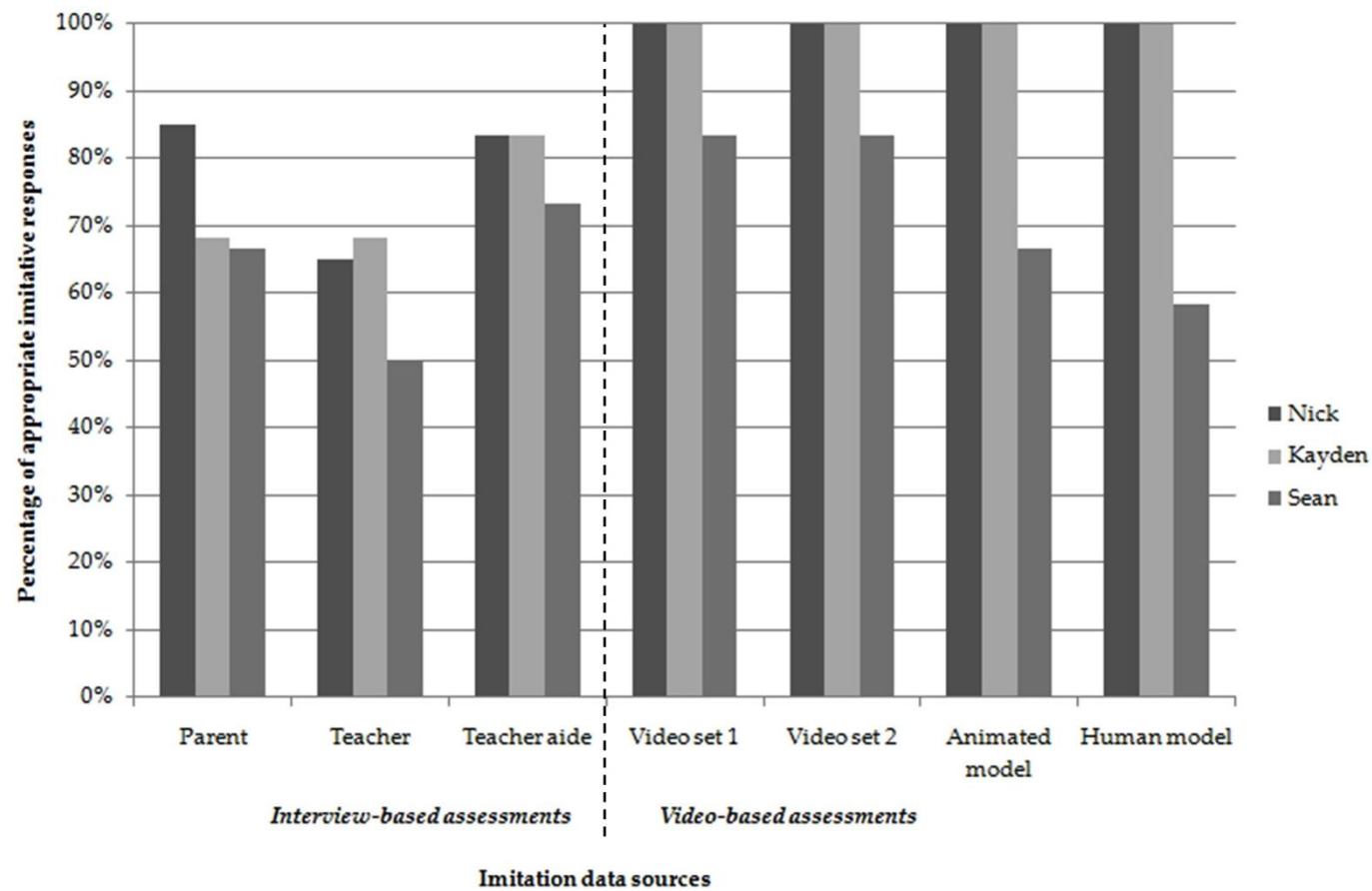


Figure 6-2. Graph showing the result for items 1 to 6 of the predicted (interview-based) and observed (video-based) imitation assessment scores for Nick, Kayden, and Sean.

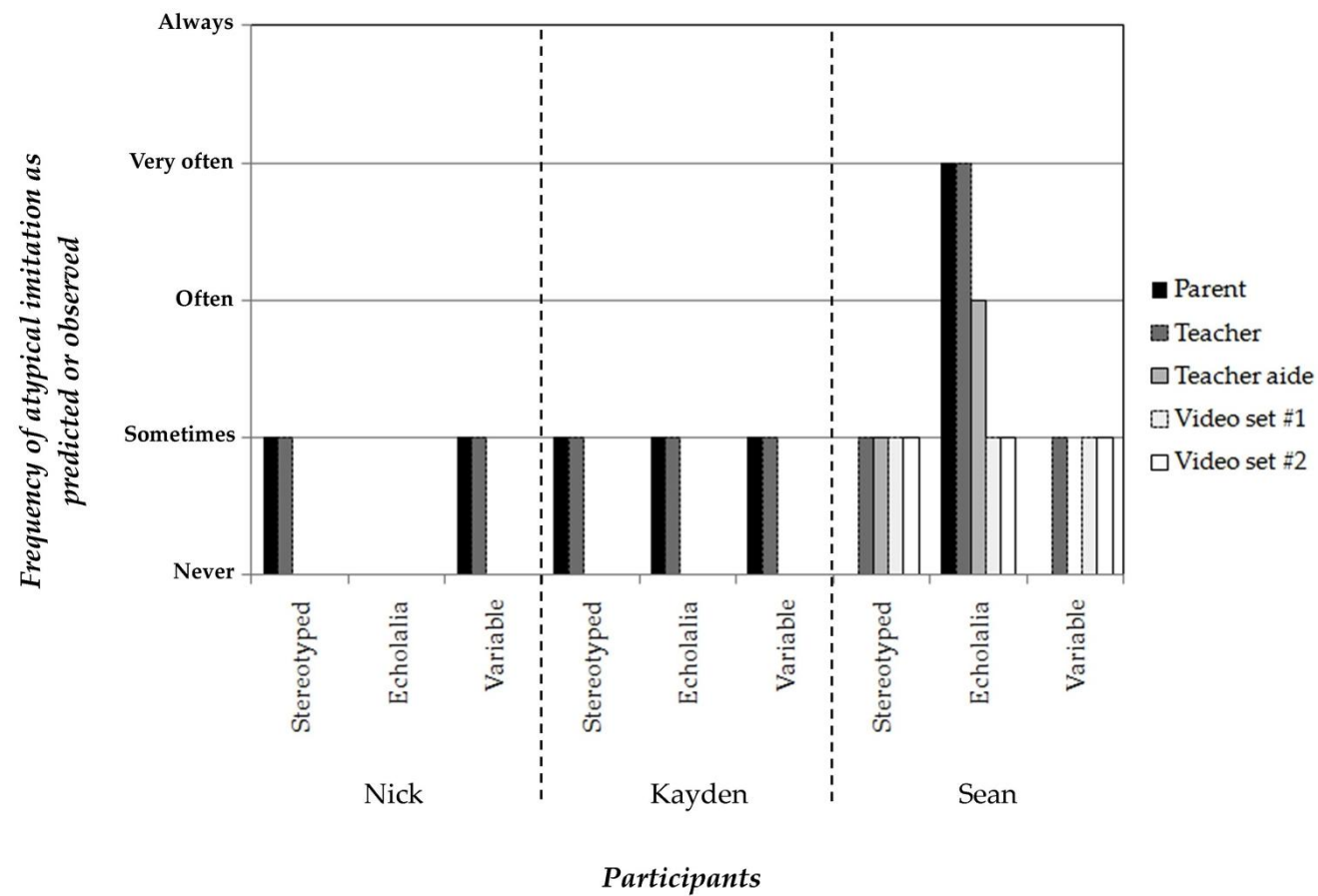


Figure 6-3. Graph showing the result for items 7, 8, and 9 of the predicted (interview-based) and observed (video-based) imitation assessment scores for Nick, Kayden, and Sean.

As shown in Table 6-3, agreement within one level of the scale between the imitation assessments for Nick ranged from 78% (between the teacher interview and both sets of video-based assessment scores), to 100% (between the two sets of video-based assessment scores). Similarly, for Kayden, agreement within one level of the scale ranged from 67% (parent interview and video-based assessment scores) to 100% (the two sets of video-based assessment scores) (see Table 6-4). For Sean's imitation assessments, agreement within one level of the scale ranged from 56% (parent interview and video-based assessment set 2 scores) to 100% (parent interview and teacher aide interview scores as well as the two sets of video-based assessment scores) (see Table 6-5).

Table 6-3. Data showing agreement within one level for the assessment of Nick's predicted (interview-based) and observed (video-based) imitation behaviour.

	Parent	Teacher	Teacher aide	Video set 1	Video set 2	Average agreement
Parent	NA	89%	100%	89%	89%	92%
Teacher	89%	NA	89%	78%	78%	84%
Teacher aide	100%	89%	NA	78%	78%	86%
Video set 1	89%	78%	78%	NA	100%	86%
Video set 2	89%	78%	78%	100%	NA	86%
Overall average agreement						87%

Table 6-4. Data showing agreement within one level for the assessment of Kayden's predicted (interview-based) and observed (video-based) imitation behaviour.

	Parent	Teacher	Teacher aide	Video set 1	Video set 2	Average agreement
Parent	NA	89%	78%	67%	67%	75%
Teacher	89%	NA	89%	78%	78%	84%
Teacher aide	78%	89%	NA	78%	78%	81%
Video set 1	67%	78%	78%	NA	100%	81%
Video set 2	67%	78%	78%	100%	NA	81%
Overall average agreement						80%

Table 6-5. Data showing agreement within one level for the assessment of Sean's predicted (interview-based) and observed (video-based) imitation behaviour.

	Parent	Teacher	Teacher aide	Video set 1	Video set 2	Average agreement
Parent	NA	89%	100%	67%	56%	78%
Teacher	89%	NA	89%	67%	89%	84%
Teacher aide	100%	89%	NA	89%	89%	92%
Video set 1	67%	67%	89%	NA	100%	81%
Video set 2	56%	89%	89%	100%	NA	84%
Overall average agreement						84%

6.3.3 The target behaviour

After consultation with parents and school staff, tying a shoelace knot was chosen as the target behaviour for this study. Previous attempts to teach Nick, Kayden, and Sean to tie their shoelaces had not been successful. Nick and Kayden typically wore shoes with Velcro straps and Sean needed to have his shoelaces tied for him. The dependent variable for this study was the number of shoelace tying steps completed independently by the participants. The relevant task analysis of this target behaviour is presented in Table 6-6. Students were deemed to have achieved mastery if they were able to complete all 11 steps in the task analysis across three consecutive sessions during generalisation probe conditions, in which a real shoe was used and no support was provided.

Table 6-6. The task analysis for the shoelace tying target behaviour.

Number	Step description
1	Cross laces over
2	Weave one lace around the other
3	Tighten laces
4	Make a loop with lace on the right
5	Make a loop with lace on the left
6	Cross loops over
7	Weave loops
8	Tighten loops
9	Cross loops over again
10	Weave loops again
11	Tighten loops again

6.3.4 Experimental design

This study was conducted using a variation of a multiple-baseline across participants and an alternating treatments design (Cooper et al., 1987; Kennedy, 2005). Data were collected for eight experimental conditions: (i) baseline, (ii) generalisation probe, (iii) VP with peer model, (iv) VP with adult model, (v) VP with two colours for the laces, (vi) backward chaining, (vii) withdrawal (Nick and Kayden only), and (viii) generalisation probe with prompts (Kayden only). The conditions involving VP with two colours for laces and the backward chaining procedure were introduced pragmatically, in response to the participants' performance plateauing without achieving mastery during the previous VP conditions. The peer or sibling model and adult model VP conditions were alternated, following baseline, to compare the relative effectiveness of these procedures (Johnston & Pennypacker, 1980).

6.3.5 Video production

During the baseline phases (after imitation assessments and before intervention), four videos were produced in which a model performed the shoelace tying steps described above in Table 6-6. One of these videos featured the researcher, an adult male who was unfamiliar to the participants prior to the study, acting as the model. The video opened with a title slide with the text 'Let's tie a shoelace knot!' and continued by showing the model from the third-person perspective holding the mock shoe provided by the school (see Figure 6-4) and repeating this statement verbally. The demonstration

of the steps in the task analysis was shown from the first-person perspective, showing the hands of the model manipulating the shoelaces.

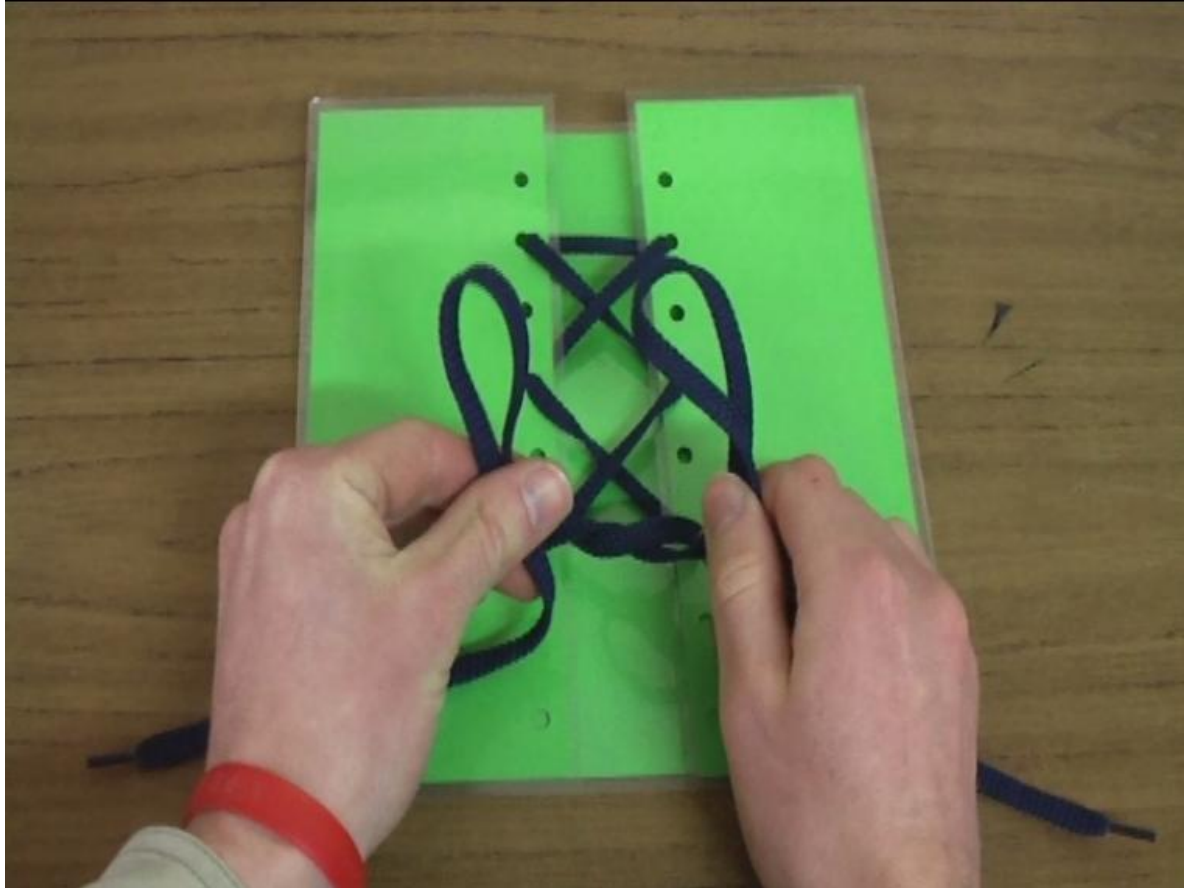


Figure 6-4. A still image from the video used in the adult as model VP condition.

Seven slides with text were embedded prior to the relevant step in the video: 'Cross the laces over', 'Weave the laces', 'Make two loops', 'Cross the loops over', 'Weave the loops', 'Cross the loops over again', and 'Weave the loops again'. All participants had demonstrated the ability to read the text embedded in the videos, although the participants' comprehension of the terms was not tested outside their performance of the target behaviour. After showing the model complete the steps in the task analysis, the video showed the model from the third-person perspective saying

‘We’ve just tied a shoelace knot!’ and included a closing slide with the text ‘Well done! Let’s do it with a real shoe!’ This video with the adult model was 2 minutes and 24 seconds in duration. The other three videos featured a boy in the same class as Nick (used in the peer model VP condition for Nick), a boy in the same class as Kayden (for the peer-as-model VP condition for Kayden) and Sean’s twin brother (for the peer-as-model VP condition for Sean). These three videos were comparable to the video featuring the adult model and were 2 minutes 23 seconds, 2 minutes 22 seconds and 2 minutes and 23 seconds in duration respectively.

During the VP phase, a fifth video was produced as a pragmatic measure. This video was comparable to the one described above for use in the adult-as-model VP condition in all but two aspects: (1) there was no opening or closing sequence showing the model from the third-person perspective; and (2) a different mock-shoe designed by the researcher was used which had blue and red coloured laces (see Figure 6-5 below). This fifth video, which was part of the conditions for the two colours VP sessions, backward chaining sessions, and withdrawal sessions, was 2 minutes and 20 seconds in duration. None of the participants were involved in the video production or were aware that videos were being produced prior to the intervention. All five videos were recorded using a Panasonic SDR-H250 digital video camera and edited using the widely available Windows Movie Maker program software on a laptop computer. The same laptop computer was used while presenting the videos for the imitation assessment and for presenting the VP intervention.

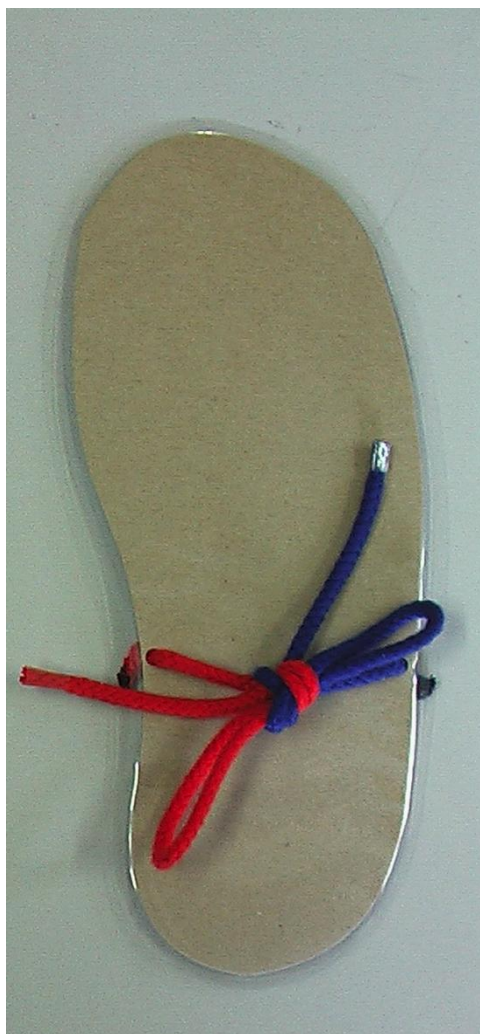


Figure 6-5. Photograph of the mock-shoe (not to scale) used in the VP two colours condition as well as the backward chaining and withdrawal conditions.

6.3.6 *Experimental conditions*

6.3.6.1 *Baseline, withdrawal, maintenance and generalisation probes*

The same procedure was implemented across baseline, withdrawal, and generalisation probe sessions; the only difference between these conditions was in regard to the resources. The participant would be seated and then presented with the mock shoe or real shoe on a desk. The researcher would then instruct the participant to

tie the shoelace knot with words such as, 'Okay, let's tie a shoelace knot' and provide the participant with an opportunity to tie a shoelace knot independently. No prompting or verbal instruction specific to the steps was provided. That is, while general instructions such as 'You do it' or 'It's your turn' were used to refocus the student on the task if necessary, specific instructions such as 'You need to cross the laces over' were not used in baseline, withdrawal, or generalisation probe sessions. If the participant did not complete steps 1 to 3, the researcher would take the mock shoe or shoe, turn his back to the participant and complete these steps. This allowed the participant the opportunity to complete further steps in the task analysis without seeing the target behaviour being performed successfully. Similarly, if the participant did not complete steps 4 to 8 successfully, the researcher would complete these steps before presenting the student with an opportunity to perform steps 9 to 11 independently.

In baseline sessions, a green laminated cardboard mock-shoe woven with dark blue lacing was used, as shown in Figure 6-4. This mock-shoe was approximately 25cm long and 20cm wide, with 16 holes. The lacing was weaved through the holes as shown prior to the student being asked to complete the shoelace knot. That is, weaving the laces through the holes was not part of the task analysis (see Table 6-6). During withdrawal sessions, a different mock-shoe was used. As shown in Figure 6-5, this single-sheet laminated cardboard mock-shoe was more comparable to a real shoe in both shape and size. It had only the two holes – one on the left and one on the right - through which a red lace and a blue lace protruded. Withdrawal conditions were used to assess maintenance for Kayden in sessions 29, 30 and 31. These three sessions were conducted after 30 days without contact from the researcher.

In contrast to the baseline and withdrawal sessions, real shoes were used during generalisation probe sessions. As indicated in Table 6-6, generalisation probe sessions did not require the participant to put the shoe on before tying the shoelace. While it would obviously be important for the participants to be able to tie their shoelaces with their own shoes on their feet, two of the three participants (Nick and Kayden) wore shoes with Velcro straps because they were not able to tie their own laces prior to the study, so they were unable to perform the target behaviour on their own shoes. Generalisation probe conditions were used to assess maintenance for Nick in sessions 25, 26, and 27. As with Kayden, these three sessions were conducted after 30 days without contact from the researcher.

6.3.6.2 *Video prompting*

While they utilised different videos, the VP with peer model, adult model and two coloured laces sessions were conducted following the same procedure. These conditions differed from the procedures used in the baseline and withdrawal sessions in that VP was provided to support the participant's completion of the target behaviour. The laptop computer was placed on the desk where the participant was seated, with the mock shoe or real shoe on the desk between them and the computer. The participant was directed to screen and instructed to 'Watch this'. After each step of the target behaviour demonstrated in the video, the video was paused and the participant was instructed to perform the particular step, with general instructions such as 'Okay, your turn'. When the participant had an opportunity to perform the step, the next step of the target behaviour was presented.

A VP procedure (showing each step followed by an opportunity to perform the step separately) was chosen for this study (Study 3) rather than a VM procedure (showing all the steps followed by an opportunity to perform all the steps). This procedure was because VP has been more effective than VM in teaching multi-step behaviour chains to individuals with developmental disabilities (Cannella et al., 2006). In Study 3, if the participant did not respond within 10 seconds after the instruction to perform the step, the step was presented a second time followed by a second opportunity to perform the step. As with all conditions, the researcher would complete steps 1 to 3, 4 to 8, and/or 9 to 11 (without showing the participant) if the participant did not complete these steps independently.

6.3.6.3 *Backward chaining and generalisation probe with prompts*

During backward chaining sessions, the participant was provided with live modelling (no video) with verbal cues, such as ‘Watch where I put this lace’. An opportunity to perform the step together with verbal correction, such as ‘Your loops need to be bigger’ and verbal instructions, such as ‘Weave the lace around the back and through the hole’ were also provided. This procedure was followed for steps 9 to 11 first (the last chunked sequence of steps), then steps 4 to 8, followed by steps 9 to 11, and then by steps 1 to 3 followed by the remaining steps (see Table 6-7). Thus, each backward chaining session gave the participant one opportunity to perform steps 1 to 3, two opportunities to perform steps 4 to 8, and three opportunities to perform steps 9 to 11.

Table 6-7. The chunked sequences of steps used in the backward chaining procedure.

Order of Chunked sequence in backward chaining procedure	Step number in the task analysis (see Table 6-6)	Step description
1 st , 3 rd & 6 th	9	Cross loops over
	10	Weave loops
	11	Tighten loops
2 nd & 5 th	4	Make a loop with lace on the right
	5	Make a loop with lace on the left
	6	Cross loops over
	7	Weave loops
	8	Tighten loops
4 th	1	Cross laces over
	2	Weave one lace around the other
	3	Tighten laces

The conditions for the generalisation probe with prompts sessions (26, 27 and 28 for Kayden) were the same as the conditions for the other generalisation probe sessions except that live modelling and verbal instructions were provided for the first three steps of the target behaviour. The live modelling and verbal instruction procedures of the generalisation probe with prompt sessions was consistent with those in the backward chaining sessions, except that they were only provided for the first three steps.

6.3.7 Data collection and reliability measures

The number of steps of the target behaviour (as described in the Table 6-6) independently performed by the participant were recorded by the researcher in all sessions. In order to evaluate the reliability of the data, a second observer independently scored the participants' performance of the target behaviour using the same task analysis. Inter-observer agreement (IOA) was calculated by using the following formula:

$$\text{Percentage of agreement} = \text{points of agreement} / \text{number of items} \times 100$$

IOA data were collected for 28 of the total 81 sessions (35%). The average IOA was 95%, and included scores from a low of 64% (1 session), through scores of 82% (2 sessions) and 91% (6 sessions) to a high of 100% (16 sessions). Due to limitations in the availability of second observers, there were differences in the number of sessions for which IOA data were collected across the three participants. Of the sessions conducted with Sean, IOA data were collected for 9 of the 23 sessions (39%), with an average of 96% agreement. IOA data were collected for 5 of the 27 sessions conducted with Nick (19%), with an average of 93% agreement. An average agreement of 95% was recorded for Kayden, with IOA evaluated for 14 of the 31 sessions (45%).

6.4 Results

6.4.1 Nick

During baseline and generalisation probe sessions prior to intervention, Nick consistently performed four of the 11 steps of the target behaviour appropriately (see Figure 6-6). The number of steps Nick completed increased during the VP conditions with the green mock shoe (shown in Figure 6-4), reaching a plateau of seven steps in session 7. Apart from a comparatively low number of steps completed in the first VP session (peer-as-model), no clear or consistent differences between data for peer-as-model and adult-as-model conditions were evident. The introduction of the VP two colours condition (shown in Figure 6-5) resulted in Nick performing eight steps in sessions 10 to 13. During all backward chaining sessions, Nick completed all eleven of the steps and demonstrated mastery of the target behaviour by continuing to complete all shoelace tying steps during the withdrawal and generalisation probe conditions of sessions 18 to 24. Nick maintained mastery of the target behaviour after an interval of 30 days. He completed all steps of the target behaviour in sessions 25, 26, and 27 with generalisation probe conditions. Also, after session 27 (outside formal data collection), Nick also demonstrated his ability to tie a shoelace knot while the shoe was on his foot to the researcher and to his classroom teacher.

6.4.2 *Kayden*

Kayden performed a maximum of one step of the target behaviour prior to intervention conditions (see Figure 6-6). A maximum of two steps were completed by Kayden during the peer-as-model and adult-as-model VP conditions (sessions 10 and 11). Kayden completed six steps in each of the four VP two colours condition. He completed 11 steps during backward chaining sessions 19 to 22 and in the withdrawal session 23. Kayden did not achieve mastery of the target behaviour, with nine steps completed during generalisation probe sessions 24 and 25. He required prompting for steps 1 to 3 in sessions 26, 27, and 28 in order to complete all 11 steps of the shoelace tying target behaviour. After the interval of 30 days, Kayden maintained his performance which was approaching mastery of the target behaviour, as demonstrated by his completion of 11, 9, and 11 steps under withdrawal conditions during sessions 29, 30, and 31 respectively.

6.4.3 *Sean*

Prior to the intervention, Sean completed a maximum of two steps during the generalisation probe sessions (with a real shoe), but did not complete any steps during the baseline sessions (with a mock-shoe) (see Figure 6-6). During the peer-as-model VP condition (featuring his twin brother), Sean's performance of the shoelace tying task varied, completing a low of zero steps (session 10 and 14) and a high of four steps (session 12), while he completed one step for each VP adult model session. Sean completed two steps in both the VP two colours sessions. His most successful

performance was in session 20 where he completed five of the 11 steps of the target behaviour. While Sean generally completed more steps during the backward chaining sessions than during other conditions, he did not approach mastery of the shoelace tying target behaviour. Sean became frustrated with being requested to perform the shoelace tying task and did not appear to be progressing towards mastery of this target behaviour. Thus, after consultation with school staff, no further intervention sessions were conducted with Sean after session 23.

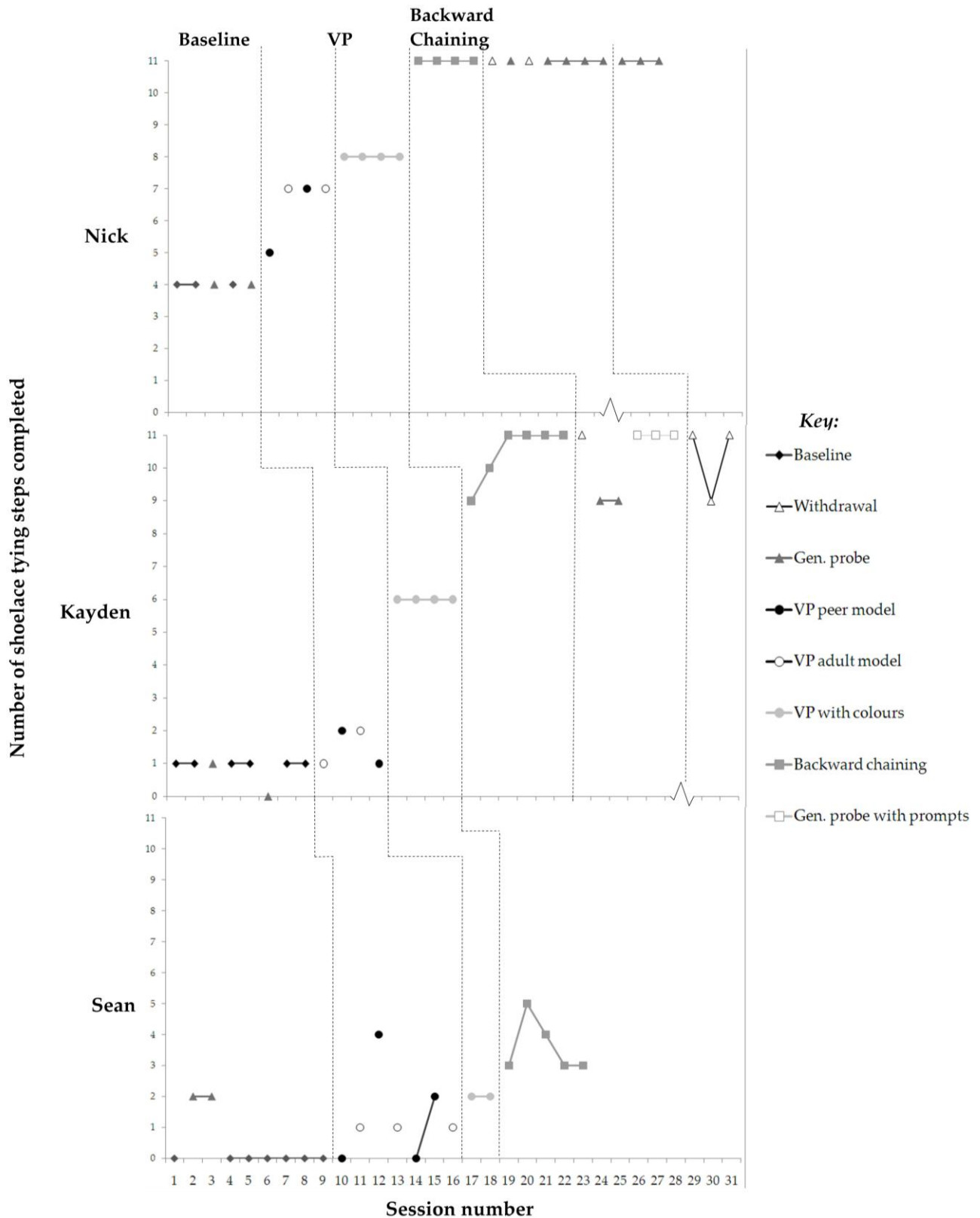


Figure 6-6. Graphs showing the number of shoelace tying steps completed by Nick, Kayden, and Sean across the eight different experimental conditions.

6.4.4 Social validity

As in the studies of *Chapter 4* and *Chapter 5*, teaching staff were given the opportunity to provide feedback on the study in order for an evaluation of social validity. In response to the question ‘Is being able to tie his shoelaces an important skill for this student?’, the relevant teachers’ responses ranged from ‘Extremely important’ for Sean and Nick, to ‘Not very important’ for Kayden. In response to the question ‘As a result of this study, can this student now tie his shoelaces in a way that increases their independence?’, the teachers’ responses were ‘Few aspects independently’ for Sean, ‘Some aspects independently’ for Kayden, and ‘Quite independently’ for Nick. In response to the question ‘Do you think that this student has found learning from video models as in this study to be enjoyable?’, the teachers’ responses ranged from ‘Neutral’ for Kayden, and ‘Enjoyable’ for Sean, to ‘Very enjoyable’ for Nick.

Written comments from Sean’s teacher, Kayden’s teacher, and Nick’s teacher (respectively) are included verbatim (except for the use of pseudonyms): ‘The use of family members in the video was beneficial for Sean’, ‘Kayden tends to copy what other students do’, ‘Transfer of the skill from template to the shoes proved initially hard.’ (Nick’s teacher had been told by Nick’s parents that he was having difficulty with the tying his shoelaces when his shoes were on his feet between intervention and follow-up phases. Such difficulties were not witnessed by the researcher and were in contrast to Nick’s observed performances, as noted previously.) Comments from Sean’s twin brother, are included below verbatim:

I liked the idea of being in a video plus it was to help my brother learn new things...It felt good because it was different and I could see what I had done on video...I thought it was great because I had fun but others can learn from what I did...thanks for letting me be involved!

Informal feedback suggested that the two other students who acted as peer models also enjoyed the process of recording the video and were proud to have made a contribution to the study.

6.5 Discussion

6.5.1 Participant characteristics and intervention effectiveness

The participants who scored higher on the imitation assessments (Nick and Kayden) responded more positively to the VP intervention. Thus, it could be concluded that the assessed level of imitation ability predicted the extent to which the participants would benefit from the VP intervention. This conclusion would support the hypothesis outlined in *Chapter 1* and *Chapter 3* of this thesis that individuals with more developed imitation skills may be more likely to benefit from VBI.

Nick and Kayden responded more positively than Sean to the backward chaining condition, which included live modelling and verbal instructions. Thus, imitation assessment data may also be helpful in predicting the likelihood of participants benefitting from the live modelling and verbal instruction, such as those used in the backward chaining procedures of this study. Alternatively, because Nick and Kayden had higher adaptive behaviour age equivalents than Sean, it could be argued that a

general measure of adaptive behaviour could have been as relevant as measures of imitation ability for predicting the effectiveness of these VP and backward chaining procedures. Notwithstanding, according to scores from their VABS assessment, the age equivalent for Sean's fine motor skills was only two months below that of Kayden and three months below that of Nick (see Table 6-2). Furthermore, with Nick and Kayden considered to be within the 'mildly to moderately autistic' range, while Sean was within the 'severely autistic' range, it could be suggested that the participants' severity of autistic impairment influenced the effectiveness of the interventions in this study.

Thus, each of the three dimensions of participant characteristics measured in this study (imitation ability, adaptive behaviour and severity of autistic impairment) could have been used in part to predict the relative efficacy of the interventions for these three students with autism. In practice, this would mean that the availability of adaptive behaviour profiles (such as those provided by the VABS) and measures of autistic severity (such as the CARS) may be helpful in predicting the relative efficacy of VP and backward chaining procedures for different participants. Also, in the absence of such assessment data, teachers and others could use a 15 minute imitation assessment (with procedures such as those used in this thesis) for making predictions about the suitability of VBI for a particular individual.

In this study, the use of an observed video-based imitation assessment seemed more appropriate than the interview with adults who knew the child, as the levels of agreement between sources raise questions about the reliability of the interview-based imitation assessment format. The video-based imitation assessment seems more relevant

for use in conjunction with VBI, as this format is similar to the actual implementation of VBI. As noted in *Chapter 4* and *Chapter 5*, the variability in assessment scores across sources, particularly the interview-based assessments, could be attributed either to subjectivity inherent in the use of the tool in the interview format, or differences in the behaviour of the participants in different contexts (home compared with school) and with different communicative partners who completed the interviews.

6.5.2 *Relative efficacy of the different model types*

No clear or consistent differences between the effectiveness of the VP procedures with adult model and peer/sibling models were observed for Nick, Kayden, or Sean. These findings are consistent with those from the comparison of sibling, peer, and adult models of Jones and Schwartz (2004); the comparison between peer-as-model and self-as-model conditions in the study of Sherer et al. (2001); as well as the comparison between VM and video-self modelling in the meta-analysis of Bellini and Akullian (2007). The number of sessions across which the different model types were compared together with the limited intervention effect for VP sessions with the different model types warrant caution regarding the conclusion that model type of itself did not effect acquisition of the target behaviour.

Despite the data not indicating that one type of model was more effective than the other in terms of the participant's acquisition of the target behaviour, the social validity feedback from the sibling who acted as a model and the informal feedback from the peer models suggested that the models consider themselves to have benefited from

being involved in the study. Together with opportunities for sustained involvement in the education of individuals with autism (Jones & Schwartz, 2004; Rivers & Stoneman, 2003; Tsao, 2006), the social benefits of involving peers and siblings as models may be used to justify the implementation of these procedures.

6.5.3 *Other variables influencing the effectiveness of the interventions*

Variables such as the level of difficulty associated with successfully performing the task, the resources used in conjunction with the intervention (i.e. the two different mock-shoes), and the participants' motivation to complete the task are likely to have influenced the outcomes of the intervention. This interpretation is supported by the way in which changing the resource used in the study from the mock-shoe with only one colour for the laces to one which included laces of different colours (blue and red) promoted the acquisition of the target behaviour, particularly for Kayden. All three participants in this study had higher scores on measures of adaptive behaviour and imitation than Regan (*Chapter 4*) and Matthew (*Chapter 5*), but the cognitive and fine motor skill demands of this shoelace tying task were greater than those of the tooth brushing (*Chapter 4*) and making noodles (*Chapter 5*) target behaviours.

Typically developing individuals usually develop the cognitive and fine motor skills necessary to tie a shoelace knot by about the age of five years (Feldman, 2003; Peterson, 2010). According to Sean's VABS assessment, his fine motor skills may have been sufficient (four years 11 months), but his overall adaptive behaviour age equivalent was just over four years. Thus, while the VP procedures had a limited effect upon the

shoelace tying performance of Nick, Kayden, and Sean, their imitation assessment scores suggest that these participants may be suited for learning to perform other less cognitively demanding daily living skills through VP or VM procedures.

Although no formal data were collected to assess the participants' motivation to tie their shoelaces, the participants' motivation may have influenced their acquisition (and generalisation) of the target behaviour. Nick often verbally expressed his interest in learning to tie a shoelace knot and commented on his own progress. Kayden often had difficulty maintaining his focus on the task, but was interested to know whether he performed the steps correctly or not. Sean was noted to become frustrated while engaging in the shoelace tying sessions and school staff questioned whether he comprehended the relevance of the target behaviour to his daily life. Thus, it could be argued that the participant's motivation resulted in more effective acquisition, and/or it could be argued that effective acquisition of the shoelace tying skill resulted in increased levels of motivation.

6.5.4 Effectiveness of the backward chaining intervention

It is difficult to directly compare the findings of the current study with those of Sadlier, Dixon, and Moore (1992) in which a backward chaining procedure was used to teach a youth with autism to tie his shoelaces. This is because the only demographic information about the participant ('T') included in their paper, was his age (14), his diagnosis ('autistic'), and the fact that previous attempts to teach him to tie his shoelaces had been unsuccessful. Also, slightly different task analyses for the target behaviours

were involved in the two studies. Even so, consistent with the findings of Sadlier, Dixon, and Moore (1992), the results of the present study demonstrate the efficacy of backward chaining procedures for teaching individuals with autism to tie a shoelace knot. Furthermore, the results of this study support the general finding that backward chaining is an appropriate method for teaching chained sequences of behaviours (Alberto & Troutman, 2006; Cooper et al., 1987).

This study also suggests that there may be some target behaviours (such as tying a shoelace knot) for which traditional approaches (such as backward chaining) are more effective. Notwithstanding, other studies have found VBI to be an effective approach for teaching other daily living skills (see Table 6-1) and this study has noted the potential social benefits received by the participants' peers or siblings who act as models. These social benefits may be particularly relevant when the participant attends school with typically developing peers, or when involving the family of the participant in the individual's intervention program, is a priority. Further research comparing VBI with backward chaining for teaching other daily living skills is needed to validate the findings of the present study. Such findings would enable practitioners to make more informed decisions regarding the choice of intervention type for teaching daily living skills to individuals with autism.

Chapter 7 - Conclusions

7.1 What this research aimed to achieve

With an increasing need to identify effective educational procedures for teaching individuals with autism, this doctoral research investigated a promising and relatively recent approach: video-based intervention (VBI). Having established the widespread support for VBI from intervention studies and reviews of the literature, this thesis identified issues relating to VBI which warranted further research. In order to inform more effective implementation of VBI and to enhance the outcomes for individuals with autism, the primary aims of the research outlined in this thesis were to address the following two questions:

1. Can a measure of a participant's imitation ability be used to predict the suitability and the effectiveness of VBI of children with autism?
2. Which model types are more effective as part of VBI for children with autism: adults, peers, siblings, or the participant themselves?

Table 7-1 provides an overview of the three intervention studies comparable to Table 1-2 of the introduction chapter, but with additional information pertaining to the outcomes of the studies.

Table 7-1. Overview of the intervention studies of this doctoral research and their outcomes.

Study / Chapter	Participant			Appropriate imitations from 60 opportunities in the video-based assessment	Target behaviour/s	Model type/s	Outcomes
	Name or pseudonym	Diagnosis	Adaptive age equivalent (years : months)				
1/4	Regan	Severe autism	2:9	34	Unpacking bag, packing bag (generalisation probe), tooth brushing	Adult model	Clear acquisition and suggested generalisation of the unpacking bag task with limited maintenance, limited acquisition of the tooth brushing task
2/5	Matthew	Severe autism	3:8	11	Coin matching, verbal responses during circle time, preparing noodles	Adult and sibling models	No clear improvements in any of the three target behaviours as a result of the VM interventions No differences were found between the effectiveness of the adult and sibling model conditions
3/6	Nick	Mild autism	6:3	60	Tying a shoe lace knot	Adult and peer models	VP led to some increase in the number of steps completed, while the backward chaining procedure assisted Nick in achieving mastery No differences were found between the effectiveness of the adult and peer model conditions

Study / Chapter	Participant			Appropriate imitations from 60 opportunities in the video-based assessment	Target behaviour/s	Model type/s	Outcomes
	Name or pseudonym	Diagnosis	Adaptive age equivalent (years : months)				
3/6	Kayden	Mild autism	6:2	60	Tying a shoe lace knot	Adult and peer models	VP led to some increase in the number of steps completed, while the backward chaining procedure assisted Kayden in approaching mastery No differences were found between the effectiveness of the adult and peer model conditions
3/6	Sean	Severe autism	4:1	42	Tying a shoe lace knot	Adult and sibling models	The backward chaining procedure seemed to be more effective than VP conditions Neither intervention led to improvements in Sean's performance of the target behaviour No differences were found between the effectiveness of the adult and sibling model conditions

7.2 The contribution of this research

7.2.1 *Imitation ability and VBI effectiveness*

Previous literature has suggested that imitation and attention skills were likely to be prerequisites for effective VBI (McCoy & Hermansen, 2007; Rayner et al., 2009; Sherer et al., 2001; Sigafoos et al., 2007c). Few studies, however, have reported on these participant characteristics or their influence upon the effectiveness of VBI. The three studies conducted as part of this thesis involved an assessment of each participant's imitative behaviour through interviews with their parents and teaching staff. Also, data were recorded for each participant from video-based imitation assessment sessions in which behaviours were presented via video. Both the interview and video-based assessments were informed by the IDE scale of Malvy et al. (1999).

Overall, data presented in this thesis supports the general hypothesis that imitation skills are a prerequisite for effective VBI and that, all other things being equal, individuals assessed to have more developed imitation skills are more likely to acquire target behaviours more rapidly than individuals with less developed imitation skills through this intervention approach. For example, Regan (*Chapter 4*) consistently imitated gestures, actions with objects, and amusing actions; subsequently, data presented in *Chapter 4* indicated that Regan responded positively to the VM interventions. In contrast, Matthew's limited gains from VM intervention may have resulted from his low level of responsiveness to imitative opportunities, as reported in *Chapter 5*. That Matthew was assessed to have the same level of autistic impairment and a slightly higher overall

adaptive age equivalent strengthens the argument that there is an important relationship between imitation ability and the effectiveness of VBI.

The findings reported in *Chapter 6* could also be used to support the stated hypothesis regarding imitation ability and VBI effectiveness, with strong imitation assessment skills and identifiable changes in performances of the target behaviour observed for Nick and Kayden. In contrast, Sean was assessed to have comparatively weaker imitation skills and the VP procedures made little, if any, difference in his performance of the shoelace knot tying task. It should be noted that unlike the participants in the study of Sherer et al. (2001), the participants in the study described in *Chapter 6* were not comparable in language or adaptive behaviour level. Compared with Nick and Kayden, Sean was limited in terms of verbal communication, was approximately 2 years lower in his level of adaptive behaviour, and had a more severe autistic impairment. It is worth noting that when Sean's performances in the imitation assessment are compared with those of Regan, it would be reasonable to suggest that Sean could indeed benefit from VBI in acquiring daily living skills that do not require the same fine-motor and cognitive demands as the shoelace tying task described in *Chapter 6*.

Other VBI studies have involved an assessment of participants' imitation skills (Hine & Wolery, 2006), attention skills (Nikopoulos & Keenan, 2003, 2004a), and other study specific prerequisites (Branham et al., 1999; Sigafoos et al., 2007b; Sigafoos et al., 2005). This thesis describes the development, implementation, and evaluation of an video-based imitation assessment procedure that is brief, informative, and relevant for

supporting the decision making around the suitability of VBI for particular individuals with autism.

7.2.2 *Comparing the types of model*

Studies have effectively used various types of model (self, sibling, peer, and adult) as part of VBI procedures for teaching individuals with autism. Through a review of the literature, this thesis examined the relative efficacy of 'self-as-model' or 'video self-modelling' (VSM) and 'other-as-model' or 'video modelling' (VM). While no clear or consistent differences between these procedures were found, the literature seemed to favour the use of VSM procedures, where possible. To address the scarcity of studies comparing different types of models in VBI for individuals with autism, the second and third studies of this thesis involved an alternating treatments tactic to compare adult-as-model and sibling-as-model (*Chapter 5* and *Chapter 6*) procedures and for adult-as-model and peer-as-model (*Chapter 6*) procedures. Comparisons between a human and an animated model were also afforded as part of the imitation assessments (*Chapter 5* and *Chapter 6*).

For Matthew (*Chapter 5*) and Sean (*Chapter 6*), there were no reportable differences between the effectiveness of the sibling-as-model or adult-as-model conditions. Similarly, for Nick and Kayden (*Chapter 6*), there were no reportable differences between the effectiveness of peer-as-model or adult-as-model conditions. There were no clear or consistent differences between the imitative responses of

Matthew (*Chapter 5*), Nick, Kayden, or Sean (*Chapter 6*) to the behaviour sequences performed by the human model and by the animated model.

The findings reported in this thesis suggest that for these participants and these target behaviours, the type of model involved in the intervention was inconsequential. Thus, while previous research has found no difference in the relative efficacy of self-as-model and other-as-model procedures (Bellini & Akullian, 2007; Sherer et al., 2001), this research reports a similar finding in relation to adult-as-model and sibling-as-model or peer-as-model procedures. This research also indicates that in some contexts, other aspects of the intervention, such as the appropriateness of the resources used and the reinforcement contingent upon performance of the target behaviour, may have greater influence on the success of VBI than the choice of model.

Another important finding reported in *Chapter 6* is that all three participants made greater gains regarding the shoelace tying target behaviour during the backward chaining procedure than during the VP procedures. Although other studies have noted the benefits of other procedures as part of VBI (Alcantara, 1994; Apple et al., 2005) and found VM to be more effective than live modelling (Charlop-Christy et al., 2000), the study of *Chapter 6* provides an example where a backward chaining procedure (including live modelling and verbal prompting) was more effective than a VBI.

7.3 Directions for future research

There are several issues that limit the conclusiveness of the findings that have warranted discussion and provide direction for future research. In particular, when

comparing the data relating to imitation skills and intervention effectiveness for Regan (*Chapter 4*) with that of Matthew (*Chapter 5*), the differences in target behaviours across these studies should be kept in mind. When comparing the imitation assessment data and intervention effectiveness for Nick, Kayden, and Sean, it is important to consider the differences in the students' respective adaptive behaviour age equivalents and the severity of their autistic impairment. Thus, further research would be beneficial to extend these findings. Ideally, such studies would target the same or comparable behaviours for intervention and involve a number of participants assessed to have comparable IQ scores, language skills, adaptive behaviour age equivalents, and severity of autistic impairment but who vary in terms of their assessed imitation skills.

It could be argued that the limited number of sessions comparing the model types and the limited effectiveness of the VBI procedures in the studies of *Chapter 5* and *Chapter 6* weaken the conclusiveness of findings from this research. With the comparisons of model types involving only four participants, four target behaviours, and two independent studies, further VBI studies with single-case research designs comparing adult, peer, and sibling models with uniform findings would be needed to support the external validity and generality of the present findings (Campbell & Stanley, 1966; Horner et al., 2005). Thus, future research may determine with greater confidence the relative efficacy of adults, peers, and siblings as models in VBI for individuals with autism. Similarly, future research could clarify the specific contexts in which one type of model (such as self-as-model) is more effective or more socially beneficial than other types of model. Notwithstanding, with this and other research suggesting that there is little if any difference in the effectiveness of VBI procedures using different types of

models for individuals with autism, researchers are also encouraged to explore other questions that are likely to lead to advances in knowledge of this intervention approach and enhance its implementation.

With a lack of behavioural flexibility, insistence on sameness, and resistance to change being problematic for the daily lives of individuals with autism, future research should investigate applications of VBI to address this common deficit among individuals with autism. The study described in *Chapter 4*, the study of Nikopoulos et al. (2009), as well as the video priming study of Schreibman et al. (2000) paint a promising picture of how in the future VBI could be applied to issues associated with the behavioural inflexibility and difficulty with transitioning often displayed by individuals with autism.

Another potentially useful direction for research is to explore ways in which VBI can become more accessible, practical, and socially acceptable. In the study by Cihak et al. (2010) four students with autism learned to operate a video iPod and then used this device to present videos to assist them in making transitions around their school. With the power of observational learning combined with the opportunities afforded by emerging technologies, a number of future applications for the effective use of VBI procedures to enhance the quality of life for individuals with autism are possible.

7.4 Implications of these findings for practice

7.4.1 *Conducting imitation assessments*

The findings of this research should encourage practitioners to evaluate the prerequisite imitation skills of individuals prior to deciding if and how VBI should be implemented. More specifically, this research supports the use of direct observations of a video-based imitation assessment procedure based on the first six items of the IDE (Malvy et al., 1999). An individual's overall performance on an imitation assessment together with data indicating areas of strength and weakness, such as actions with objects or facial expressions, could be useful in designing effective interventions. If the imitation assessment indicates that the participant does not have the prerequisite skills necessary for a specific VBI, practitioners should consider other intervention approaches or target imitation skills directly. Interestingly, a recent study has shown that an intervention package including VM was effective for teaching generalised imitation skills to a young child with autism (Kleeberger & Mirenda, 2010).

Anecdotal observations and informal feedback suggested that several respondents had difficulty answering questions in the interview-based imitation assessment that corresponded to items 7, 8 and 9 of the IDE (atypical imitation). For item 7 (stereotyped gestures), it was difficult for respondents to distinguish between general stereotyped gestures and imitative behaviours that were stereotyped. There was some confusion between item 4 (imitation of words and sounds) and item 8 (echolalia), although contextually appropriate imitation is quite different from echolalia (Loddo,

2003; Malvy et al., 1999). Some respondents found it difficult to conceptualise item 9 (imitation variability), which may simply have reflected the fact the participants in question rarely performed these kinds of behaviours. The IDE scale of Malvy et al. (1999) which informed this procedure was developed and validated for clinical observations, and data yielded from its use as a tool for interviewing parents and educators may not be as reliable as interview-based data from the *Vineland Adaptive Behaviour Scales* (VABS) (Sparrow et al., 2005a, 2005b) or the *Childhood Autism Rating Scale* (CARS) (Schopler et al., 1980; Schopler et al., 1988).

While this research does not discount the use of the interview-based format, assessment of imitation based on the IDE, there is reason to support the use of direct observations that involved presenting behaviours for imitation via a laptop computer. Notwithstanding, some simplification of the procedure may enhance its practicality. One alteration could involve removing IDE item 2 ('visual pursuit'). Visual pursuit has been identified as an important precursor to imitation skills (Malvy et al., 1999), but the item did not seem practical in the context of a video-based imitation assessment to predict the effectiveness of VBI. This is because it was quite difficult to assess visual pursuit by observing and recording the participant's eye movements that corresponded to the movement of the model and objects on the computer screen. The visual pursuit item assessed the participant's attention to the screen, which was prompted if necessary as part of the procedure protocol. Other measures of a participant's ability to attend, such as those used by Nikopoulos and Keenan (2003, 2004a) may be more practical for measuring a participant's ability to attend to a screen than the inclusion of the 'visual pursuit' item in the procedure used in the studies of this thesis. A second alteration to

make the procedures more practical could involve removing IDE items 7, 8, and 9 from the video-based assessment. Based on the findings in this study, this alteration may alleviate difficulties in quantifying these atypical imitation behaviours and may make the tool more accessible for use by parents and educators without clinical training in the use of the IDE.

7.4.2 The selection of model type

The finding of this and other research that no clear or consistent differences between the effectiveness of the different model types used as part of a VBI is enabling rather than constraining. This finding suggests that practitioners should consider the type of model within the context of their specific circumstances. Practitioners may choose to make use of self-as-model procedures where the target behaviour to be increased is already present within the participants' repertoire. Also, as demonstrated in the studies of Houlihan et al. (1995) and Maione and Mirenda (2006), self-as-model procedures may be appropriate for following up on behaviours that were previously taught using other approaches. Peer models may be particularly relevant for situations in which a lack of self-efficacy is thought to be a constraint on the participant's performance of the target behaviour, or in situations where the target behaviour needs to become more socially acceptable from the perspective of the participant. Sibling models may be appropriate for interventions to be conducted in homes or generalised to home settings. Sibling models may also be appropriate where the social benefits for the model as well as the acquisition of the target behaviour by the participant, are deemed

to be an important aspect of the intervention, allowing the sibling to be more involved in the education of the participant with a disability.

7.4.3 *The setting of the intervention*

The introduction of this thesis included a rationale for the researcher's support of mainstream school classrooms as well as specialised educational settings, and this research has been conducted within both of these contexts. The findings and experiences gained from this research provide direction for how VBI could be used in specialised educational settings in the future. For students like Regan (*Chapter 4*), with no siblings living at the same address at the time of the study and with his peers all having multiple and/or severe disabilities, an adult model may be the only realistic option for implementing VBI. This thesis has supported the general finding that the use of adult-as-model VBI procedures can be effective. Indeed, this research has suggested that in terms of the acquisition of target behaviours, adult-as-model procedures may be as effective as any other type of model for individuals with autism. For students like Nick and Kayden (*Chapter 6*) who are being encouraged to engage in the curriculum of the mainstream school classroom with typically developing peers, involving peers with the modelling process may support their social inclusion within their classroom and school community. Giving the peers responsibility in the process of video recording, video editing, and video evaluation could be an innovative way to encourage their own learning, particularly in terms of their use of information and communication technology and multi-media projects. Whether enrolled in mainstream or special education settings, the learning experiences designed for students with autism should be

informed by evidence-based practices as identified by research. VBI is one such approach that could lead to positive outcomes for individuals with autism and for their peers in a range of settings.

7.4.4 Other issues for consideration

In addition to providing preliminary answers to the primary research questions, this research has highlighted several important issues that relate to the effective implementation of VBI, and, most probably, to the implementation of other intervention approaches. One such issue relates to the individual's motivation to complete the task. Observations from each of the three studies suggested that the participant's motivation to complete the relevant target behaviour affected their performance. This was illustrated by Matthew's motivation to prepare the noodles even prior to the VM intervention, compared with his reluctance to participate in the coin matching task despite the VM intervention (*Chapter 5*). Eating the noodles seemed to be a powerful reinforcer for Matthew, and yet the non-contingent provision of jelly-beans as reinforcement for participation did not appear to be as effective in motivating him to engage with the coin matching task. It could be argued that the VM procedure itself provided sufficient motivation for Regan (*Chapter 4*) to alter his performance of the relevant daily living skills.

Depending on the context and target behaviours, participants may experience skill deficits (their ability to perform the target behaviour) and/or performance deficits (the willingness to perform the target behaviour). Thus, practitioners may consider

whether an individual is likely to be motivated by simply watching a video, whether the task itself is reinforcing, or whether the task has naturally reinforcing outcomes. If not, practitioners should consider how contingent (performance-based) or non-contingent (participation-based) reinforcement could be included to promote the motivation required for the participant to successfully engage in and perform the target behaviour.

Another issue that practitioners should consider when planning to implement VBI or other intervention approaches is whether or not the resources are appropriate for supporting the participant to successfully acquire and demonstrate the target behaviour. For example, while teaching Nick, Kayden, and Sean to tie a shoelace knot (*Chapter 6*), two 'mock-shoes' were used. After a number of baseline and video-prompting sessions, it was apparent that the initial mock-shoe resource (provided by the school) was not ideal for teaching the specific target behaviour. It was not shaped like a shoe, it had weaving that was unnecessary for the target behaviour, and the uniform colour of the laces did not assist the participants in comprehending the steps involved in tying the shoelace knot. In contrast, the mock-shoe that was developed (pragmatically by the researcher) was the same shape and size as a shoe, the laces were arranged to be relevant for the target behaviour only, and the contrasting colours made it easier for the participants to see how the laces were manipulated in each step of the task analysis. The change in resource from one mock-shoe to the other clearly assisted Kayden's performance of the target behaviour and seemed to benefit Nick's and Sean's performances. Consequently, teachers and other practitioners are encouraged to evaluate the relevance, simplicity, and overall suitability of the resources used in

conjunction with their intervention in the context of the specific target behaviour and the individual needs of the participant.

Another important consideration for practitioners highlighted by this research relates to the selection of the most appropriate intervention approach for specific contexts. The utility of the imitation assessment procedures for identifying whether or not an individual is suited to VBI has already been discussed. For Regan (*Chapter 4*), VBI seemed to be particularly relevant. This finding suggests that there may be individuals with autism who have not learned through traditional educational approaches (such as verbal instructions and prompting) who could benefit from the implementation of VBI. Similarly, other approaches (such as verbal instruction, live modelling and prompting) may be more effective than VBI for teaching individuals like Matthew (*Chapter 5*) relevant skills and behaviours. The finding that backward chaining was more effective for teaching tying a shoelace knot to Nick, Kayden, and Sean suggests that although a participant may have the necessary prerequisites to benefit from VBI, some target behaviours would be taught more effectively through the use of other traditional approaches informed by the principles of applied behaviour analysis. Therefore, although this thesis argues that VBI is an important strategy that practitioners may find useful, other evidence-based practices should also be considered when selecting the most suitable intervention approach for a specific target behaviour.

7.5 Summary

7.5.1 *Summative discussion*

This thesis highlights the relevance of video-based intervention (VBI) for individuals with autism. Having identified gaps in the literature, this research investigated the relationship between imitation ability and the effectiveness of VBI, as well as the relative efficacy of various types of models. The findings support the hypothesis that individuals assessed to have stronger imitation skills are more likely to benefit from VBI. No clear or consistent differences were found between adult-as-model and sibling-as-model or peer-as-model VBI conditions.

Further research is encouraged to determine the generality of these findings; in particular, other studies may experiment with the use of the imitation assessment procedures to predict the outcomes of VBI and explore whether or not there are specific contexts in which one type of model is more effective than others. It is also anticipated that future researchers will explore other applications of VBI for addressing the specific needs of individuals with autism. These applications could include addressing issues associated with the lack of behavioural flexibility demonstrated by some individuals with autism. The opportunities provided by the increased availability of relevant technologies could also enable a range of modes of delivery for VBI in school classrooms and in homes in the years to come.

By assessing potential participants' imitation skills through procedures such as those described in this thesis, practitioners can gain useful information about the

suitability of VBI for particular individuals and target behaviours. Teachers, teacher aides, parents, and other professionals could implement various forms of VBI procedures using adults, peers, siblings or the participant themselves as models to effectively teach individuals with autism important skills and behaviours. By also considering factors such as participants' motivation to perform the task and appropriateness of the resources used in conjunction with the intervention, practitioners can increase the likelihood that VBI will promote the independence and enhance the quality of life of individuals with autism as part of an evidence-based educational program.

7.5.2 *Summative statements*

- I. VBI can be an effective approach for teaching important skills to individuals with autism;
- II. An assessment of imitation ability can be useful in predicting the likelihood that VBI will be an effective approach for a particular individual;
- III. A student's imitation abilities are required, but do not guarantee, the success of VBI for all target behaviours;
- IV. Any differences between the effectiveness of the use of different model types (such as adults, peers, and siblings) appear to be contextual rather than generally;

- V. The development, refinement, and implementation of evidence-based teaching approaches, such as VBI, are important for enhancing their quality of life for individuals with autism, as well as the quality of life of their family, school, and community.

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Appendices

Appendix A: Human Research Ethics Committee (Tasmania) approval

<p>MEMORANDUM</p>	<p>Private Bag 01 Hobart Tasmania 7001 Australia Telephone (03) 6226 2764 Facsimile (03) 6226 7148 Marilyn.Knott@utas.edu.au http://www.research.utas.edu.au/index.htm</p>	
<p>HUMAN RESEARCH ETHICS COMMITTEE (TASMANIA) NETWORK</p>		

FULL COMMITTEE ETHICS APPLICATION APPROVAL

16 October 2008

Professor Carey Denholm
Faculty of Education
Conservatorium of Music
Private Bag 66
Hobart

Ethics reference: H10238

'Video-based interventions for individuals with Autism'.

Christopher Rayner (PhD candidate)

Dear Professor Denholm

The Tasmania Social Sciences HREC Ethics Committee approved the above project on the 13th of October 2008.

All committees operating under the Human Research Ethics Committee (Tasmania) Network are registered and required to comply with the *National Statement on Ethical Conduct in Human Research* (NHMRC 2007).

Therefore, the Chief Investigator's responsibility is to ensure that:

- 1) All researchers listed on the application comply with HREC approved application.
- 2) Modifications to the application do not proceed until approval is obtained in writing from the HREC.
- 3) The confidentiality and anonymity of all research subjects is maintained at all times, except as required by law.
- 4) Statement 5.5.3 of the National Statement states:

Researchers have a significant responsibility in monitoring approved research as they are in the best position to observe any adverse events or unexpected outcomes. They should report such events or outcomes promptly to the relevant institution/s and ethical review body/ies and take prompt steps to deal with any unexpected risks.

- 5) All participants must be provided with the current Information Sheet and Consent form as approved by the Ethics Committee.
- 6) The Committee is notified if any investigators are added to, or cease involvement with, the project.

A PARTNERSHIP PROGRAM IN CONJUNCTION WITH THE DEPARTMENT OF HEALTH AND HUMAN SERVICES

- 7) This study has approval for 4 years contingent upon annual review. A *Progress Report* is to be provided on the anniversary date of your approval. You will be sent a courtesy reminder closer to this due date.
- 8) A *Final Report* and a copy of the published material, either in full or abstract, must be provided at the end of project.

Yours sincerely



Ethics Executive Officer

Appendix B: Department of Education (Tasmania) approval

Department of Education
EDUCATIONAL PERFORMANCE SERVICES

2/99 Bathurst Street, Hobart
GPO Box 169, Hobart, TAS 7001 Australia



File: 860034

25 August 2009

Prof Ian Hay
Dean, Faculty of Education
University of Tasmania
Locked Bag 1307
LAUNCESTON TAS 7250

Dear Prof Hay

Video-based interventions for individuals with autism

I have been advised by the Educational Performance Report Committee that the above research study adheres to the guidelines established and that there is no objection to the study proceeding.

Please note that you have been given permission to proceed at a general level. You must still seek approval from the principals of the selected schools before you can proceed with your study.

When the selection process is finalised and before you proceed with the research, please advise us of the names of the schools selected.

A copy of your final report should be forwarded to Patricia Lloyd, Educational Performance Services, Department of Education, GPO Box 169, Hobart 7001 at your earliest convenience and within six months of the completion of the research phase in the Department of Education schools.

Yours sincerely



Manager
(Educational Performance Services)

Cc: Christopher Rayner

Appendix C: Video-based imitation assessment data collection sheet

Video-based imitation assessment based on the Imitation Disorders Evaluation of Malvy et al. (1999)

WATCH CAREFULLY AND COPY ME

"Hello! For this game, I am going to do things and you need to do what I do. So watch carefully and copy me!"

Item #1

MAKING FACES!	Correct	Notes for Item 7-9			MAKING FACES AGAIN!	Correct	Notes for Item 7-9		
"Smile"					"Smile"				
"Frown"					"Frown"				
"Squashed"					"Squashed"				
"Shocked"					"Shocked"				
"Tongue"					"Tongue"				
Total									

Item #2

FOLLOW WITH YOUR EYES!	Correct	Notes for Item 7-9			(torch) "Okay, follow the torch with your eyes"	Correct	Notes for Item 7-9		
<i>Left</i>					<i>Left/diagonal</i>				
<i>Right</i>					<i>Down</i>				
<i>Left</i>					<i>Right</i>				
<i>Right</i>					<i>Up</i>				
<i>Left</i>					<i>Left</i>				
Total									

Item #3

COPY ME!	Correct	Notes for Item 7-9			COPY ME AGAIN!	Correct	Notes for Item 7-9		
"Wave"					"Wave"				
"Clap"					"Clap"				
"Nod"					"Nod"				
"Shake"					"Shake"				
"Touch your nose"					"Touch your nose"				
Total									

Item #4

SAY THESE WORDS! "Okay, say these words"	Correct	Notes for Item 7-9			SAY THESE WORDS AGAIN! "Okay, say these words"	Correct	Notes for Item 7-9		
"Mum"					"Mum"				
"Dad"					"Dad"				
"Yes"					"Yes"				
"No"					"No"				
"Ta"					"Ta"				

Total				
--------------	--	--	--	--

Item #5

DO THIS!	Correct	Notes for Item 7-9			DO THIS AGAIN!	Correct	Notes for Item 7-9		
Push a toy car					Push a toy car				
Look in a mirror					Look in a mirror				
Tip over an egg timer					Tip over an egg timer				
Lift spoon to mouth					Lift spoon to mouth				
Drop ball on table					Drop ball on table				
Total									

Item #6

OKAY, LET'S HAVE SOME FUN!	Correct	Notes for Item 7-9			OKAY, LET'S DO THAT AGAIN!	Correct	Notes for Item 7-9		
Funny face					Funny face				
Peek-a-boo					Peek-a-boo				
Mexican wave					Mexican wave				
Rocking side-to-side					Rocking side-to-side				
Spin around					Spin around				
Total									

Student	
Instructor	
Evaluator	
Date/Time	
Total Correct	
Total Item 7	
Total Item 8	
Total Item 9	

Appendix D: Interview-based imitation assessment data collection sheet**Imitation ability interview**Based on the *Imitation Disorders Evaluation* (IDE) Scale of Malvy et al. (1999)

<i>Date and Time:</i>
<i>Place:</i>
<i>Interviewee/Parent/Guardian:</i>
<i>Child/Student:</i>
<i>Pseudonym:</i>
<i>Interviewer/Researcher:</i>

Item 1 Facial expressions - Does (*Name*) imitate facial expressions such as smiling, grimacing and putting out his/her tongue that you or others are displaying?

Never 0/5	Sometimes 1/5	Often 2 or 3/5	Very often 4/5	Always 5/5	IDE Scale Conversion

Item 2 Visual pursuit - Does (*Name*) follow you (or others) with his/her eyes when you move around the room or when you move an object?

Never 0/5	Sometimes 1/5	Often 2 or 3/5	Very often 4/5	Always 5/5	IDE Scale Conversion

Item 3 Gestures - Does (*Name*) imitate gestures including clapping hands, waving 'bye-bye', touching nose, etc.

Never 0/5	Sometimes 1/5	Often 2 or 3/5	Very often 4/5	Always 5/5	IDE Scale Conversion

Item 4 Sounds, words or sentences – Does (*Name*) imitate sounds or words that you have heard them say and also ‘mama’, ‘dada’, ‘mummy’ and ‘daddy’ etc.

Never 0/5	Sometimes 1/5	Often 2 or 3/5	Very often 4/5	Always 5/5	IDE Scale Conversion

Item 5 Actions with objects - Does (*Name*) imitate actions with objects such as dropping a block, pushing a toy car, giving a doll a drink with a cup and food with a spoon?

Never 0/5	Sometimes 1/5	Often 2 or 3/5	Very often 4/5	Always 5/5	IDE Scale Conversion

Item 6 Amusing actions - Does (*Name*) play ‘peek-a-boo’ or tickling, etc?

Never 0/5	Sometimes 1/5	Often 2 or 3/5	Very often 4/5	Always 5/5	IDE Scale Conversion

Item 7 Stereotyped gestures – Are (*Name*)’s imitations stereotyped or atypical (persistent, fixed, repeated, and apparently meaningless) - often observed with toy cars or spoon?

Never	Sometimes	Often	Very often	Always	IDE Scale Conversion

Item 8 Echolalia – Does (*Name*) engage in stereotyped or atypical verbal imitation.

Never	Sometimes	Often	Very often	Always	IDE Scale Conversion

Item 9 Imitation Variability – Does (*Name*) begin an action and stop; or imitate only the actions with one object or only the sound and ignores the others?

Never	Sometimes	Often	Very often	Always	IDE Scale Conversion

Total IDE Scale Score:	
Average Score:	

Relationship between IDE category/score and interview score for items 1 to 6 inclusive

Always = 4 (+) <i>Representing 0/5 correct imitations</i>	Very often = 3 (+) <i>Representing 1/5 correct imitations</i>	Often = 2 (+) <i>Representing 2 or 3 correct imitations</i>	Sometimes = 1 (+) <i>Representing 4/5 correct imitations</i>	Never = 0 (+) <i>Representing 5/5 correct imitations</i>
--	--	--	---	---

Imitation Profile

4												
3												
2												
1												
Facial expressions												
Visual pursuit			Gestures		Sounds, words		Actions with objects		Amusing actions		Stereotyped gestures	
Imitation variability			Echolalia		Imitation variability							
Item Description-----												

Appendix E: Video-based imitation assessment comparing human and animated models data collection sheet

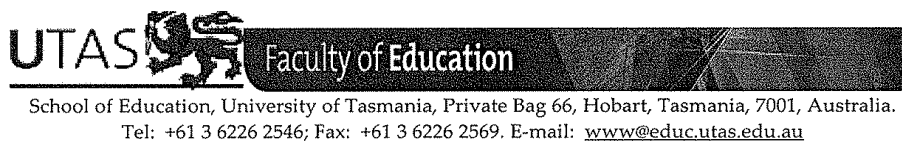
Imitation assessment with animated and human models

“Okay, for this game you need to copy me, so watch carefully and do what I do.”

<i>Animated model</i>				<i>Human model</i>			
	Yes	Partial	No		Yes	Partial	No
Wave hello				Wave hello			
Nod your head				Nod your head			
Wiggle your body				Wiggle your body			
Shake your head				Shake your head			
Show me your hands				Show me your hands			
Put your hands on your hips				Put your hands on your hips			
Lift your elbows				Lift your elbows			
Clap your hands				Clap your hands			
Touch your nose				Touch your nose			
Cross your arms				Cross your arms			
Point from side to side				Point from side to side			
Wave good-bye				Wave good-bye			
TOTAL				TOTAL			

“Thanks for playing! Have a great day. Bye!”

Appendix F: Intervention feedback form



Name of Participating Student:

1. Is being able to (target behaviour) an important skill for your child? (Please circle the appropriate answer)

Not important at all	Not very important	Important	Quite important	Extremely important
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2. As a result of this study, can your child now (target behaviour) in a way that increases their independence?

Still totally dependent	Few aspects independently	Some aspects independently	Quite independently	Totally independently
----------------------------	------------------------------	-------------------------------	------------------------	--------------------------

3. Do you think that your child has found learning from video models as in this study to be enjoyable?

Very unenjoyable	Unenjoyable	Neutral	Enjoyable	Very enjoyable
---------------------	-------------	---------	-----------	-------------------

4. Are there any comments, suggestions, or other feedback you would like to provide?

.....
.....
.....
.....

Thank you for taking the time to offer this feedback.

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copyright or proprietary reasons.

Appendix I: Advertisement included in the Department of Education's Infostream Bulletin used for participant recruitment

Title:	Video modelling for individuals with autism
Description:	We are extending an invitation for students of primary or secondary age diagnosed with autism to participate in a research study using video as a way to teach important skills and behaviours.
Further information:	<p>Video modelling has been recognised as an effective, evidence-based practice for teaching students with autism spectrum disorders a range of communication, social and daily living skills. We are interested in working with several students who have a diagnosis of autism, to teach skills or behaviours which they need to learn, as identified by parents and teachers. The aim is to investigate video modelling in classroom settings and explore the relationship between imitation ability and video modelling effectiveness. We are also interested in the effectiveness of different kinds of models: adults, peers, animated characters, and the participant themselves. This research has the approval of the Tasmanian Human Research Ethics Committee (HREC) and the Department of Education, Tasmania.</p> <p>Staff or parents are encouraged to contact Chris (see details below) for more information and/or to express interest.</p>
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